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**FRONTIER HARD CHROME  
LONG-TERM MONITORING REPORT  
EVENT 18  
VANCOUVER, WASHINGTON**

*Prepared for*

**Washington State Department of Ecology  
PO Box 47600  
Olympia, Washington 98504**

Weston Work Order No. 10799.004.004.0002

December 2012

*Prepared by*

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USEPA SF



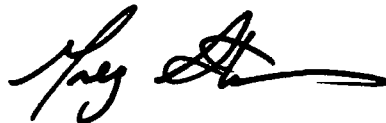
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**Washington State Department of Ecology  
PO Box 47600  
Olympia, Washington 98504**

Prepared  
and  
Approved By:



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Greg Stuesse, PE, LG  
Senior Project Manager

Date: December 27, 2012



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## 1. INTRODUCTION AND BACKGROUND

### 1.1 INTRODUCTION

This Long-Term Monitoring Report has been prepared under an individual Authorization/Contract with the State of Washington Department of Ecology (Ecology) for Long-Term Monitoring of the Frontier Hard Chrome (FHC) site located in Vancouver, Washington.

This report describes the sampling activities performed and analytical results obtained during "Event 18" of the Long-Term Groundwater Monitoring program at FHC. Sampling activities for Event 17 were conducted from October 15-18, 2012.

The FHC site was the subject of a remedial action (RA) conducted during the summer of 2003. The purpose of the remedial action was to treat the site's chromium-contaminated soil and groundwater to cleanup levels specified in the Record of Decision. Long-term monitoring is required to track off-site plume concentrations as well as show that the remedy is maintaining its operational functionality.

The first three FHC groundwater monitoring events (Events 1 through 3) were conducted for the United States Environmental Protection Agency (EPA). In October 2004, responsibility for the site was turned over to Ecology. Ecology contracted Weston Solutions, Inc. (WESTON®) to perform the next two rounds of monitoring (Events 4 and 5) as a result of WESTON's familiarity with this site and the associated property owners. Ecology amended WESTON's contract in February 2006 and again in July 2007 to perform 14 additional rounds of quarterly monitoring with the last to be completed in June 2009.

In the summer and fall of 2007, EPA conducted a Long-Term Monitoring Optimization (LTMO) study to assess monitoring requirements at the FHC site. As a result of this study, ten wells were deleted from the monitoring program (EPA, 2008). Ecology amended WESTON's contract to delete the remaining monitoring events except for Event 14, which was completed in September 2008. Event 15 (September, 2009), Event 16 (September, 2010), Event 17 (September, 2011), and Event 18 (October 2012) were each completed under annually-issued individual Authorization/Contracts

This report documents the results of sampling under the new individual Authorization/Contract between Ecology and WESTON.

All Event 18 work was performed in accordance with the project work plan titled *Frontier Hard Chrome, Long-Term Monitoring Plan* (Weston, 2004).

## **1.2 BACKGROUND AND PROBLEM DEFINITION**

### **1.2.1 Site Background**

The FHC site is located at 113 "Y" Street in southeastern Vancouver, Washington. The site is located in Section 25, Township 2 North, Range 1 East, of the Willamette Meridian in Clark County, Washington. The geographic coordinates for the site are 45° 37' 18.8" North latitude and 122° 38' 43.3" West longitude. A site location map is shown in Figure 1.

The site was historically occupied by several metal fabricating businesses. In addition, the site was historically used for storage and as a staging area for adjacent facilities. As of October 2012, there were no buildings or permanent structures located on site. The entirety of the site, as well as the adjacent parcels to the south and east, were enclosed behind a chain link fence and were being used for equipment/vehicle storage and minor maintenance of plumbing and heating, ventilation, and air-conditioning (HVAC) equipment. The site encompasses approximately 0.5 acres and is bordered to the north by a scrap metal facility, to the east by a campus of the Northwest Renewable Energy Institute, to the south by the property addressed as 2428 East 1<sup>st</sup> Street (formerly occupied by the Test-U truck driving school), and to the west by "Y" Street. A site layout map is shown in Figure 2.

The FHC site was historically occupied by chrome plating facilities between approximately 1958 and 1983. The property was first developed in approximately 1958 with the addition of hydraulic dredge fill material and construction rubble. Pioneer Plating operated at the site from approximately 1958 to 1970 and Frontier Hard Chrome operated at the site from approximately 1970 to 1983. Between approximately 1958 and 1976, untreated process wastewater from the facility, which included hexavalent chromium and additional heavy metals, was discharged directly to the City of Vancouver's sanitary sewer system. In approximately 1976, the City of Vancouver and Ecology requested that the facility cease discharging all chromium-contaminated wastewaters to the system. Subsequent to this request, Frontier Hard Chrome began discharging the untreated chromium-contaminated wastewater to an on-site "dry well," which continued for approximately seven years. In December 1982, the FHC site was proposed for inclusion on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liabilities Act (CERCLA or Superfund). FHC terminated its operations in January 1983.

Work began on the remedial design for the FHC site in October 2001 and was completed in February 2003. The RA; which consisted of building demolition, treatment of source area soil and groundwater, and installation of an in-situ redox manipulation (ISRM) treatment wall; was completed in September 2003.

### **1.2.2 Problem Definition**

The goal of the RA was to treat source area soil and groundwater to reduce hexavalent chromium concentrations such that groundwater downgradient of the site would attenuate to chromium concentrations of less than 50 micrograms per liter ( $\mu\text{g/L}$ ). To demonstrate this, groundwater quality was monitored in two areas. The first area consisted of wells located immediately within and downgradient of the ISRM treatment wall, which were monitored to ensure the continued

operational functionality of the ISRM wall. The second area consisted of the historical chromium-contaminated groundwater plume located downgradient of the ISRM wall. This plume, which did not receive treatment during the RA, was monitored to track the long-term expected reduction in chromium concentrations as a result of the elimination of the source of hexavalent chromium and the ISRM wall.

Long-term groundwater monitoring is required by the site's Record of Decision. Additional information regarding regulatory actions related to the FHC site is available at the EPA Region 10 Cleanup Sites website: <http://yosemite.epa.gov/R10/cleanup.nsf/sites/cleanuplist>.

### 1.3 MONITORING SCHEDULE

Groundwater sampling and monitoring events were conducted approximately quarterly by EPA for the first year after completion of the RA. Planned events were completed in February, April, and August 2004. The sampling event performed the week of August 16, 2004 concluded monitoring for approximately one year after the RA was completed.

In September/October 2004, monitoring of the FHC site was turned over to Ecology. Sampling of the site groundwater for Ecology occurred in May and December 2005 under the Original Contract with WESTON. In February 2006, Ecology amended WESTON's contract (Amendment #1) to perform six additional rounds of quarterly monitoring that would occur in March 2006, June 2006, September 2006, December 2006, March 2007, and June 2007.

In July 2007, additional funding was received from Ecology for an additional eight quarters of groundwater monitoring (Amendment #3). These additional quarterly monitoring events were scheduled for September 2007, December 2007, March 2008, June 2008, September 2008, December 2008, March 2009, and June 2009.

In June 2008 as a result of the recommendations of the LTMO study (EPA 2008), Ecology issued Amendment #4 to WESTON which removed the remaining rounds of sampling from the contract with the exception of a single event to be completed in September 2008. The work conducted in September 2009 (Event 15), September 2010 (Event 16), and September 2011 (Event 17) was completed under individual Authorization/Contracts.

This report documents the results of the October 2012 (Event 18) sampling event.

## 2. SAMPLING ACTIVITIES AND RESULTS

### 2.1 MONITORING WELL SAMPLING PROCEDURES

Sampling activities for Event 18 were conducted from October 15 through October 18, 2012 by WESTON staff in accordance with the *Long-Term Monitoring Plan* (Weston 2004). The monitoring wells in the vicinity of the FHC site are shown on Figure 2. Twenty-two (22) wells were sampled in October 2012. These wells consisted of the following:

Shallow "A" Zone Wells:	Deep "B" Zone Wells:
B85-3	RA-MW-12B
B85-4	RA-MW-12C
B87-8	RA-MW-15B
RA-MW-12A	RA-MW-16B
RA-MW-15A	W85-6B
RA-MW-16A	W92-16B
RA-MW-17A	W97-19B
W85-6A	W98-21B
W92-16A	W99-R5B
W97-18A	
W97-19A	
W98-21A	
W99-R5A	

Monitoring well construction information and the field data sheets from Event 18 are provided in Appendix E.

Well purging and sampling were performed according to sampling guidelines and WESTON standard operating procedures (SOPs). The wells were sampled with a peristaltic pump equipped with new polyethylene tubing deployed to mid-screen depth at each well. The wells were purged prior to sampling until monitored field parameters (turbidity, conductivity, pH, dissolved oxygen, ORP, and temperature) stabilized. The field parameter readings were recorded on field sampling forms.

Based upon the Event 16 (September 2010) analytical results, EPA and Ecology determined that it was no longer necessary to analyze the FHC groundwater samples for the complete list of Priority Pollutant (PP) metals and only chromium was retained for the Event 17 (September 2011) and the Event 18 (October 2012) analyses.

All wells were sampled for total chromium per EPA Method 200.7 inductively-coupled plasma/atomic emission spectrometry (ICP-AES). In cases where groundwater turbidity was greater than 10 nephelometric turbidity units (NTUs), samples were passed through a 0.45-micron filter in the field and submitted for dissolved chromium analysis. A total of three field-filtered groundwater samples submitted for dissolved chromium analysis. These samples were collected from wells: RA-MW-12A, which had a turbidity reading in excess of 10 NTU; RA-MW-15B, which had a turbidity reading of less than 10 NTU but has historically exhibited anomalously elevated chromium concentrations in unfiltered samples; and B87-8, which had a turbidity reading of less than 10 NTU but was observed to have black particulates in the water column. Total and dissolved chromium concentrations from the 22 collected samples are presented in Table 1.

One well, B87-8, was additionally sampled for hexavalent chromium. This sample, which was not field filtered since the turbidity was less than 10 NTU, was collected and delivered to the laboratory on October 17, 2012.

Selected samples were analyzed for sulfate and dissolved sulfur to provide an assessment of the distribution of byproducts from the reducing agent used during ISRM treatment wall installation. Dissolved sulfur samples were passed through a 0.45-micron filter in the field. These samples were collected from wells: W85-6A, W99-R5A, B85-4, and B87-8. Sulfate and dissolved sulfur concentrations, as well as additional measured field parameters are presented in Table 2.

## 2.2 ANALYTICAL RESULTS

### 2.2.1 Chromium

Chromium was detected in 8 of the 22 wells sampled. The laboratory reporting limit for total chromium was 2.50 µg/L and for dissolved chromium was 5.00 µg/L.

Seven of the shallow "A" zone wells exhibited chromium concentrations that were at or above the laboratory reporting limit. These wells included: RA-MW-12A (61.9 µg/L total chromium, 6.08 µg/L dissolved chromium), RA-MW-15A (9.00 µg/L total chromium), B87-8 (6.86 µg/L total chromium, < 5 µg/L dissolved chromium), W85-6A (4.21 µg/L total chromium), W98-21A (2.95 µg/L total chromium), RA-MW-17A (2.71 µg/L total chromium), and W92-16A (2.50 µg/L total chromium). The shallow "A" zone groundwater chromium concentrations and estimated plume contours are presented in Figure 3. Filtered sample data (when available) were used in preparing Figure 3.

Three of the deeper "B" zone wells exhibited chromium concentrations that were at or above the laboratory reporting limit. These wells included: W92-16B (3.03 µg/L total chromium), RA-MW-16B (3.03 µg/L total chromium), and W85-6B (2.50 µg/L total chromium). The deeper "B" zone groundwater chromium concentrations and estimated plume contours are presented in Figure 4. Filtered sample data (when available) were used in preparing Figure 4.

Hexavalent chromium was not detected at a concentration greater than the method reporting limit of 50 µg/L in the groundwater sample collected from well B87-8.

Figures showing the chromium concentration trends in groundwater over time are included in Appendix A. Filtered sample data (when available) were used in preparing the figures. Available data from wells sampled during Operational and Functional monitoring in November/December 2003 are included to assist in determining trends. The Event 18 laboratory data sheets for chromium are provided in Appendix B.

### 2.2.2 Water Quality

Dissolved oxygen (DO) concentrations measured during the Event 18 sampling ranged from a low of 0.17 mg/L to a high of 10.86 mg/L. DO averaged 1.19 mg/L in samples collected from wells within the ISRM treatment wall (RA-MW-12A [2.88 mg/L], RA-MW-12B [0.20 mg/L], RA-MW-12C [0.49 mg/L]). The DO concentrations indicate the wall is still reductive which is necessary for treatment of hexavalent chromium. Samples of groundwater collected downgradient of the ISRM treatment wall had similar concentrations of DO compared to those within the treatment wall.

The groundwater pH measured during the Event 18 sampling ranged from 6.25 to 7.78. The maximum pH was measured in well RA-MW-12C and the minimum pH was measured in well W97-18A.

Sulfate concentrations from the four submitted samples ranged from 14.6 mg/L to 62.5 mg/L and dissolved sulfur concentrations ranged from 5.1 mg/L to 22.0 mg/L. The maximum sulfur and sulfate concentrations were exhibited in the samples collected from well B87-8, which is located downgradient of the ISRM treatment wall along the south side of East 1<sup>st</sup> Street.

## 2.3 GROUNDWATER FLOW DIRECTION AND ELEVATION

Groundwater surface elevations were determined using the known elevation of the top of each well casing and the depth to groundwater measured in each long-term monitoring well. The depth to groundwater measurements were collected from 18 wells between approximately 12:00 and 14:00 hours on October 15, 2012. Groundwater elevations were not measured in well W85-3A since the well could not be located. Groundwater elevation data is presented in Table 4 and Figure 5.

The calculated groundwater elevations in wells W97-19A and W97-19B have been anomalously low during the last several sampling events. The casing elevations for these two wells, in addition to three other wells, were corrected after completion of the RA due to two different datums having been historically used at the site. The remaining three wells were resurveyed in 2007 due to the development of the shopping center. It is suspected that the correction factor, which was an average based on the relative differences from eight wells, is not appropriately applied to these wells. Based upon this information, data from these wells was not used in groundwater flow direction and elevation calculations.

A new concrete pad for roll-off containers was installed at the location of well W98-20A since the previous sampling event. The well monument visually appeared to have been preserved during the installation of the pad; however, the groundwater elevation measurements collected from the well during this event were anomalously high. It is suspected that the well casing may



have been impacted by the construction of the concrete pad and this well was not used in groundwater flow direction and elevation calculations.

The Columbia River elevation at the United State Geological Survey (USGS) gauging station 14144700, which is located approximately 1.3 miles west of the FHC site at the northern end of the I-5 Bridge, was obtained for use in determining flow direction. Between 12:00 and 14:00 hours on October 15, 2012, the elevation of the river ranged from 2.94 to 3.42 feet above mean sea level (AMSL) (corrected to NGVD 1929 by adding 1.82 feet to the measured gage height). The daily mean elevation for October 15, 2012 was 4.60 feet AMSL. The river elevation information can be obtained from <http://waterdata.usgs.gov/usa/nwis/uv?14144700>.

Excluding the anomalous data from wells W97-19A, W97-19B, and W98-20A; the groundwater surface elevations ranged from 4.60 feet AMSL in well W99-R5A to 4.83 feet AMSL in well B85-3. Utilizing the depth to groundwater data collected between 12:09 and 13:39 on October 15, 2012, groundwater in the vicinity of the FHC site flows in a generally southwest to west-southwest direction with a horizontal gradient of approximately 0.00008 feet per foot (ft/ft). Due to the relatively flat gradient at the site, the groundwater flow direction is estimated to vary across the field area.

## 2.4 QUALITY ASSURANCE

Data quality was verified by collecting field duplicate samples. Laboratory duplicates and matrix spike analyses were performed by the analytical laboratory. The quality control results are presented in Table 5.

Field duplicates were collected from four of the sampled wells including: W85-6A (QA-1), B85-4 (QA-2), RA-MW-15B (QA-3), and RA-MW-12A (QA-4). The duplicate sample collected from W85-6A was analyzed for sulfate. The duplicate samples collected from B85-4 and RA-MW-12A were analyzed for total chromium (unfiltered). The duplicate sample collected from RA-MW-15B was analyzed for dissolved chromium (filtered) and total chromium (unfiltered).

The field duplicate sample, QA-1, collected from well W85-6A, had good correlation with the original sample result for sulfate [0.5% relative percent difference (RPD)].

The field duplicate sample, QA-2, collected from well B85-4, could not be correlated to the original sample result for total chromium since neither the duplicate nor the original sample exhibited concentrations of this analyte above the laboratory reporting limits.

The field duplicate sample, QA-3, collected from well RA-MW-15B, could not be correlated to the original sample result for either total chromium or dissolved chromium since neither the duplicate nor the original sample exhibited concentrations of these analytes above the laboratory reporting limits.

The field duplicate sample, QA-4, collected from well RA-MW-12A, had relatively poor correlation with the original sample result for total chromium (16.9% RPD). Well RA-MW-12A has a relatively slow recharge rate and the groundwater from this well has relatively high

turbidity (12.1 NTU). The relatively high RPD between the duplicate and original samples from this well is likely due to variations in the amount of total suspended solids.

## 2.5 INVESTIGATION-DERIVED WASTES

Investigation-derived waste (IDW) generated during the sampling event consisted of well purge/decontamination water, used PPE, and disposable sampling supplies. During sampling, purge/decontamination water was stored on site in 5-gallon buckets. At the completion of sampling event, the water was transported to the City of Vancouver's operations center and disposed of in accordance with the Special Wastewater Discharge Authorization Number 2010.06, which was issued to WESTON by the City of Vancouver on September 7, 2010 and is valid through September 7, 2015. Approximately 60 gallons of purge/decontamination water was disposed to the City's sanitary sewer system. PPE and other solid IDW were disposed to general refuse.

## 2.6 DISCUSSION AND CONCLUSIONS

Chromium concentrations, which are reported here using dissolved (field-filtered) fractions when available, were detected above laboratory reporting limits in 6 of the 13 samples collected from the wells screened in the shallower "A" groundwater zone. The concentrations ranged from 2.50 micrograms per liter ( $\mu\text{g/L}$ ) to 9  $\mu\text{g/L}$ . The maximum concentration was detected in well RA-MW-15A, which is located immediately downgradient from the in-situ redox manipulation (ISRM) treatment wall. The remaining five samples with detectable concentrations were collected from wells RA-MW-12A, RA-MW-17A, W92-16A, W85-6A, and W98-21A. Well RA-MW-12A is located at the ISRM treatment wall. The remaining four wells are located approximately 75 feet east, 105 feet southwest, 550 feet south, and 850 feet south of the ISRM, respectively. During the sampling of well RA-MW-12A, groundwater was observed to be relatively turbid throughout the purging process. This relatively high turbidity is thought to be due to the presence of insoluble chromium compound particulates. The sample collected from well B87-8 was additionally analyzed for hexavalent chromium; however, the sample did not exhibit a concentration that exceeded the laboratory reporting limit of 50  $\mu\text{g/L}$ . The relative locations of the sampled "A" zone wells are presented in Figure 3.

Chromium concentrations were detected above laboratory reporting limits in 3 of the 9 samples collected from within the wells screened in the deeper "B" groundwater zone. The concentrations of the samples, which are reported here using dissolved (field-filtered) fractions when available, ranged from 2.50  $\mu\text{g/L}$  to 3.03  $\mu\text{g/L}$ . These samples were collected from wells RA-MW-16B, W92-16B, and W85-6B; which are located approximately 110 feet southeast, 115 feet southwest, and 550 feet south of the ISRM, respectively. The relative locations of the sampled "B" zone wells are presented in Figure 3.

The exhibited concentrations in samples collected from both the shallow "A" groundwater zone and the deeper "B" groundwater zone were similar to those reported during the previous Event 17 (September 2011) sampling event.

Dissolved oxygen (DO) data collected from the three sampled wells at the ISRM treatment wall; which included RA-MW-12A, RA-MW-12B, and RA-MW-12C; indicates that an area of reducing conditions still exists and therefore that the hexavalent chromium treatment zone is still

active. The DO concentrations at these wells ranged from 2.88 milligrams per liter (mg/L) in the shallow well to 0.20 mg/L and 0.49 mg/L in the deeper wells. In addition, the negative oxygen reduction potential (ORP) data collected from these wells, which ranged from -178 millivolts (mV) to -278 mV, implies that reducing conditions are present within the ISRM treatment wall.

Sulfur and Sulfate concentrations in the two sampled wells (B87-8 and B85-4) that are located approximately 200 feet downgradient of the ISRM treatment wall were approximately 49 percent higher than the previous Event 17 concentrations. The concentrations in the two sampled wells (W85-6A and W99-R5A) that are located between approximately 550 feet and 2,400 feet downgradient of the ISRM wall were similar to the previous round of sampling.

### **3. ANALYTICAL METHODS AND DATA VALIDATION**

#### **3.1 ANALYTICAL METHODS REQUIREMENTS AND DATA VALIDATION**

The laboratory data quality assurance review and validation of analytical results for 26 water samples has been completed (22 field samples and 4 field duplicate samples). Samples were collected between October 15 and 18, 2012 from monitoring wells at the Frontier Hard Chrome site and were analyzed for total recoverable chromium. In addition, three samples were analyzed for dissolved chromium, one sample was analyzed for hexavalent chromium, and four samples were analyzed for both sulfate and dissolved sulfur.

The quality assurance review was performed on the laboratory data sheets and the Ecology memorandum to ensure that the analytical results met data quality objectives for the project. All laboratory quality assurance results as applicable (e.g., holding times, blank sample analysis, matrix spike/duplicate analysis, laboratory control sample analysis) supplied to WESTON for the analyses met acceptance criteria specified in the work plan (Weston 2004), with no exceptions noted.

Samples collected from three wells; RA-MW-12A, RA-MW-15B, and B87-8; were collected both as total recoverable and dissolved fractions – with one fraction submitted for total recoverable chromium analysis and the other filtered at the time of collection and submitted for dissolved chromium analysis. An additional sample was collected from wells RA-MW-12A, RA-MW-15B, and B85-4 as field duplicates and submitted for total recoverable chromium analysis. Additionally, a field duplicate sample was collected from well RA-MW-15B and submitted for dissolved chromium analyses and a field duplicate sample was collected from well W85-6A and submitted for sulfate analysis. Field duplicate samples were not collected for hexavalent chromium or dissolved sulfur analysis.

Data validation documentation is provided in Appendix D.

#### **4. REFERENCES**

EPA (United States Environmental Protection Agency), 2008. Five Year Review Report for Frontier Hard Chrome Superfund Site. January, 2008.

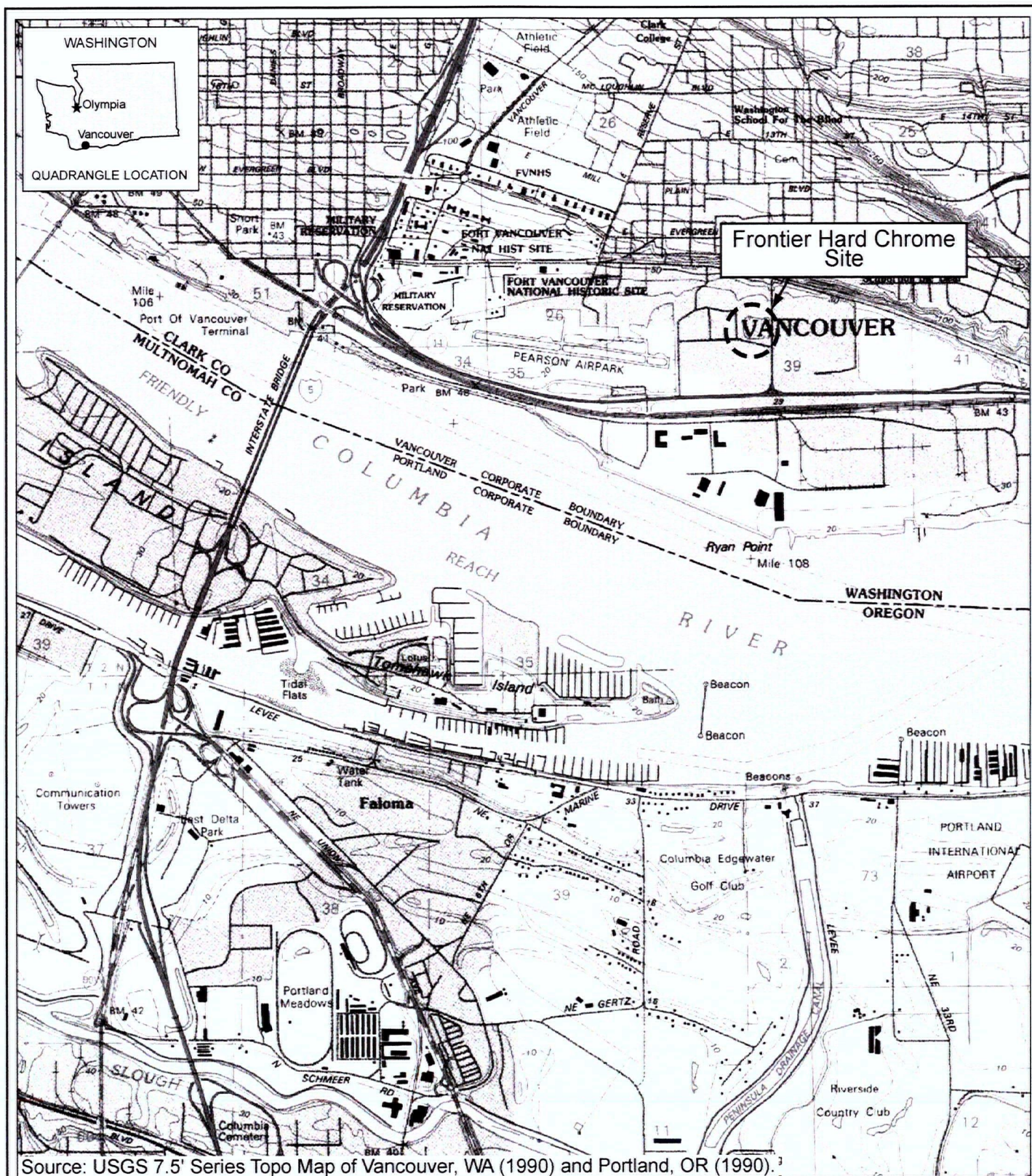
Weston (Weston Solutions, Inc.), 2004. Frontier Hard Chrome Long-Term Monitoring Plan. Prepared for the United States Environmental Protection Agency, Region 10, Seattle, Washington. February. 2004.



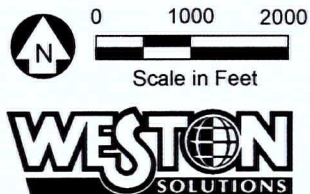
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## FIGURES

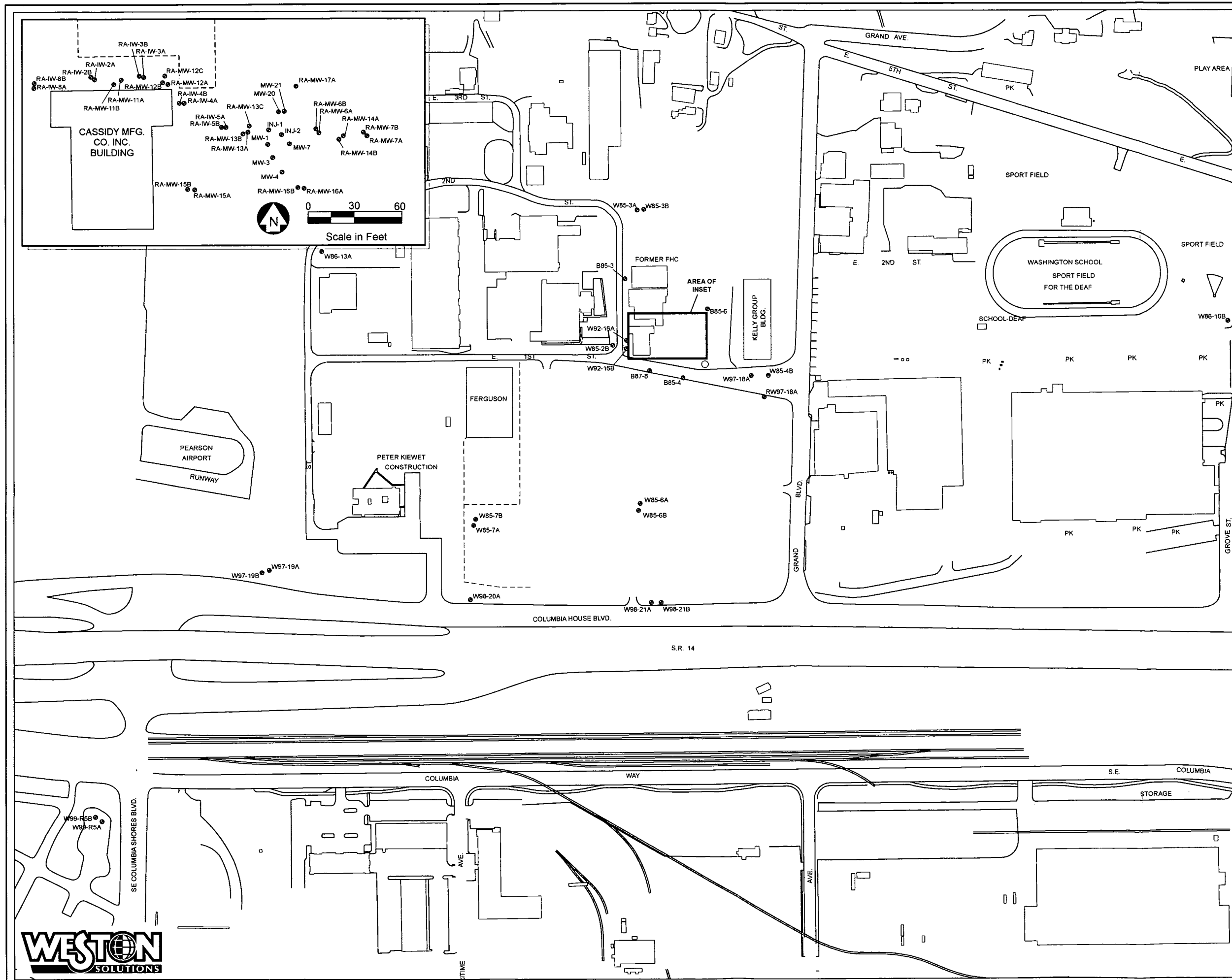




# Frontier Hard Chrome Vancouver, Washington Vicinity Map

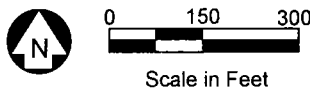






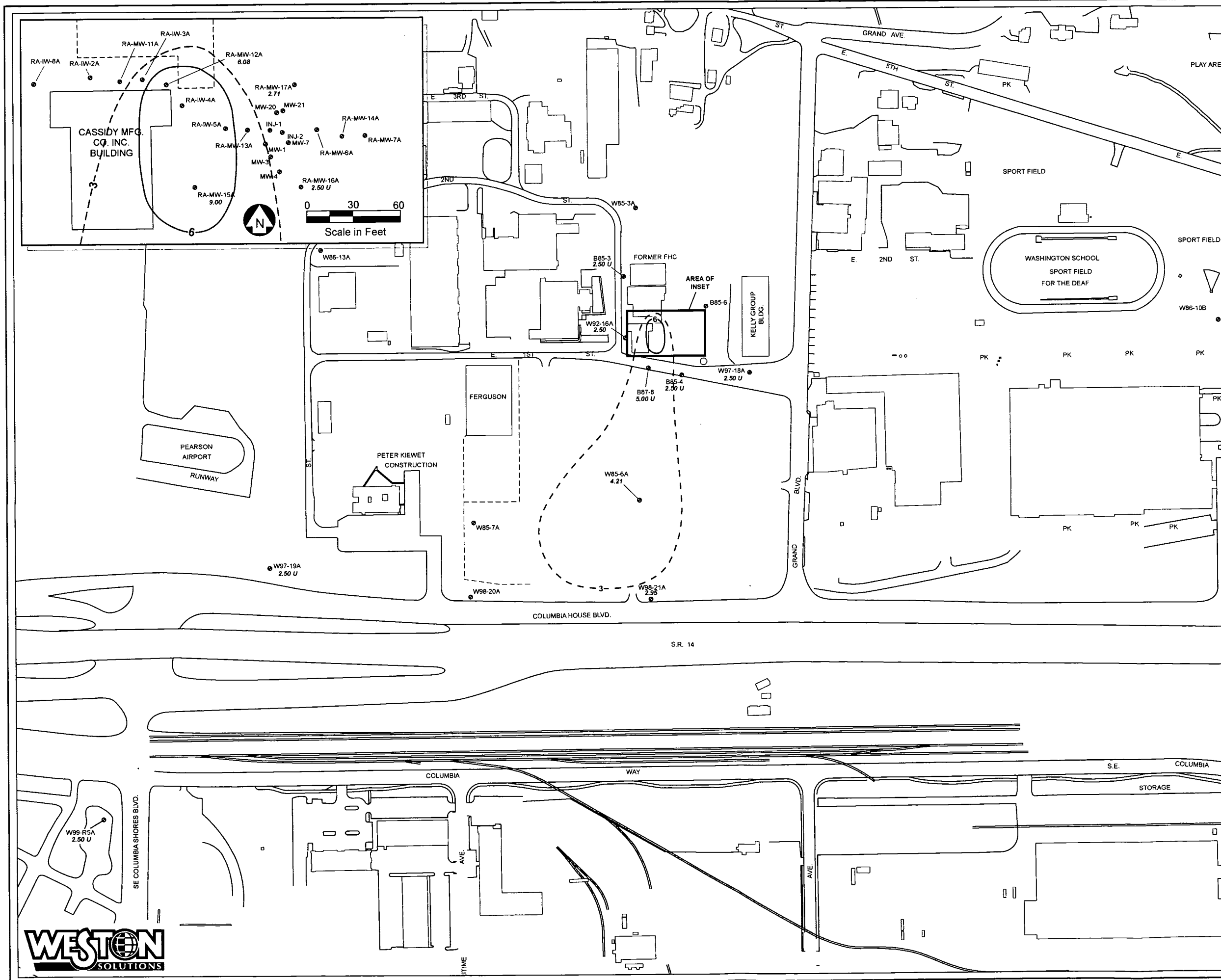
# LEGEND

- W85-5B ● Monitoring Well Location and ID
- W85-4B ● Abandoned Well Location and ID
- Fence



Frontier Hard Chrome  
Vancouver, Washington  
Monitoring Well Locations

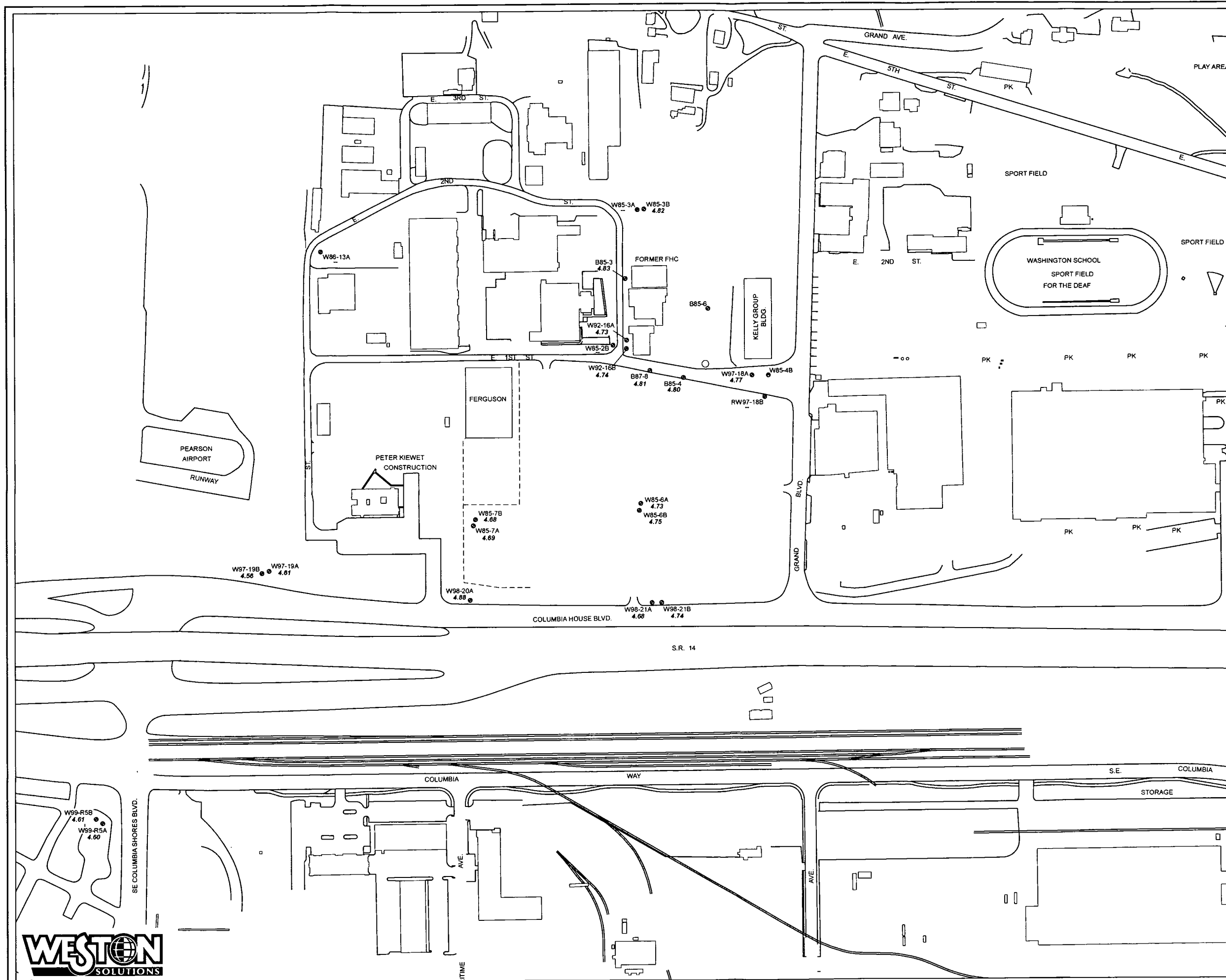




**Frontier Hard Chrome  
Vancouver, Washington  
Chromium Concentrations  
in Zone A Groundwater  
October 2012**

Figure  
**3**





# LEGEND

- W85-7A ● Monitoring Well Location and ID
- W85-4B ● Abandoned Well Location and ID
- 3.93 Groundwater Elevation (ft. AMSL)
- Not Measured



0 150 300  
Scale in Feet

Frontier Hard Chrome  
Vancouver, Washington  
Groundwater Elevations  
October 15, 2012



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## **TABLES**

**Table 1: Frontier Hard Chrome - Event 18 Chromium Results**

Well Number <sup>1</sup>	Concentration (µg/L)		Sample Observations
	Total	Dissolved	
B85-3	2.50 U	—	Clear; no significant odor or sheen
B85-4	2.50 U	—	Clear; no significant odor or sheen
B87-8	<b>6.86</b>	5.00 U	Clear; no sheen; slight sulfur odor
RA-MW-12A	<b>61.9</b>	<b>6.08</b>	Clear; no sheen; strong sulfur odor
RA-MW-12B	2.50 U	—	Clear; no sheen; moderate sulfur odor
RA-MW-12C	2.50 U	—	Clear; no significant odor or sheen
RA-MW-15A	<b>9.00</b>	—	Clear; no significant odor or sheen
RA-MW-15B	2.50 U	5.00 U	Clear; no significant odor or sheen
RA-MW-16A	2.50 U	—	Clear; no significant odor or sheen
RA-MW-16B	<b>3.03</b>	—	Clear; no significant odor or sheen
RA-MW-17A	<b>2.71</b>	—	Clear; no significant odor or sheen
W85-6A	<b>4.21</b>	—	Clear; no significant odor or sheen
W85-6B	<b>2.50</b>	—	Clear; no significant odor or sheen
W92-16A	<b>2.50</b>	—	Clear; no significant odor or sheen
W92-16B	<b>3.03</b>	—	Clear; no significant odor or sheen
W97-18A	2.50 U	—	Clear; no significant odor or sheen
W97-19A	2.50 U	—	Clear; no significant odor or sheen
W97-19B	2.50 U	—	Clear; no significant odor or sheen
W98-21A	<b>2.95</b>	—	Clear; no significant odor or sheen
W98-21B	2.50 U	—	Clear; no significant odor or sheen
W99-R5A	2.50 U	—	Clear; no significant odor or sheen
W99-R5B	2.50 U	—	Clear; no significant odor or sheen

— = Not Analyzed

U = analyte not detected above laboratory reporting limit

µg/L = micrograms per liter

<sup>1</sup> = Only the 22 wells that were proposed to be sampled during Event 17 are included.



**Table 2: Frontier Hard Chrome - Event 18 Monitoring Field Parameters<sup>1</sup>**

Well Number <sup>2</sup>	Temp (°C)	Specific Cond. (mS/cm)	DO (mg/L)	pH	ORP (mV)	Dissolved Sulfur <sup>3</sup> (mg/L)	Sulfate <sup>3</sup> (mg/L)	Turbidity (NTU)
B85-3	12.54	0.875	0.28	6.82	-58.1	—	—	0.44
B85-4	13.19	0.416	0.38	6.77	119.1	20	54.9	0.21
B87-8	13.29	0.394	0.42	6.79	-16.5	22	62.5	7.47
RA-MW-12A	14.06	2.271	2.88	7.50	-278.0	—	—	12.10
RA-MW-12B	13.45	0.855	0.20	7.40	-214.3	—	—	0.79
RA-MW-12C	13.23	0.557	0.49	7.78	-178.2	—	—	0.30
RA-MW-15A	13.14	1.108	0.42	6.53	2.6	—	—	0.18
RA-MW-15B	13.23	0.388	0.19	7.23	67.0	—	—	0.31
RA-MW-16A	13.33	0.919	0.43	6.54	67.2	—	—	0.63
RA-MW-16B	13.41	0.781	0.17	6.83	110.4	—	—	0.18
RA-MW-17A	13.04	1.052	0.37	6.52	-35.4	—	—	0.64
W85-6A	14.26	0.249	5.07	6.54	101.8	7.9	22.2	0.14
W85-6B	14.20	0.217	10.86	7.65	107.0	—	—	0.24
W92-16A	13.88	0.343	0.24	6.60	111.3	—	—	1.33
W92-16B	13.43	0.271	9.27	6.93	134.2	—	—	0.52
W97-18A	13.75	0.173	1.00	6.25	150.4	—	—	0.37
W97-19A	14.11	0.249	2.85	6.55	111.8	—	—	0.27
W97-19B	14.01	0.255	2.80	6.70	126.0	—	—	0.37
W98-21A	14.13	0.253	4.53	6.34	154.7	—	—	0.23
W98-21B	13.69	0.274	4.92	6.49	155.8	—	—	0.16
W99-R5A	14.08	0.246	4.38	6.40	140.4	5.1	14.6	0.23
W99-R5B	13.94	0.250	4.86	6.64	141.1	—	—	0.19

— = Not Analyzed

mg/L = milligrams per liter

mV = millivolts

NTU = nephelometric turbidity unit

mS/cm = milliSiemens per centimeter

1 = Parameters recorded after measurements stabilized

2 = Only the 22 wells that were sampled during Event 18 are included

3 = Sulfate and Dissolved Sulfur data obtained from laboratory analysis

Table 3: Comparison of Conventional Parameters

Well Number	Temperature (°C)																	
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Mar-07	Jun-07	Sep-07	Dec-07	Sep-08	Sep-09	Sep-10	Sep-11	Oct-12
B85-3	14.6	14.8	15.2	15.8	14.4	14.1	13.6	14.6	12.4	12.5	13.6	13.7	13.1	8.0	14.0	13.2	14.0	12.5
B85-4	14.1	14.4	15.1	14.4	13.9	13.5	14.3	14.5	13.8	14.6	14.4	—	13.5	8.7	14.7	17.0	14.9	13.2
B87-8	14.5	14.7	15.8	15.2	14.7	14.4	14.5	14.4	13.8	14.4	14.3	14.5	13.6	8.8	14.3	13.7	14.6	13.3
RA-MW-12A	14.9	15.9	17.9	15.2	14.9	14.6	14.3	14.9	13.9	14.0	13.9	14.4	13.8	8.7	15.5	13.5	14.5	14.1
RA-MW-12B	14.4	16.6	16.7	15.6	14.3	14.9	14.4	14.5	13.4	14.3	14.1	14.4	13.3	8.5	14.2	13.7	14.0	13.5
RA-MW-12C	14.4	16.5	16.6	15.1	14.2	14.3	14.2	14.2	13.1	13.3	14.1	14.1	13.2	8.5	14.4	13.2	14.5	13.2
RA-MW-15A	14.3	14.5	15.0	15.0	14.7	14.8	14.7	15.1	14.7	15.3	15.1	14.7	13.6	9.0	14.6	14.1	14.3	13.1
RA-MW-15B	13.9	14.4	15.4	14.7	14.1	14.0	14.5	17.2	14.1	14.8	14.9	14.3	13.4	8.8	14.6	14.0	14.3	13.2
RA-MW-16A	14.3	14.9	16.0	14.9	15.1	13.3	13.4	14.8	13.8	14.0	13.9	14.1	—	8.6	14.2	13.8	14.2	13.3
RA-MW-16B	14.3	14.6	16.0	14.7	13.9	13.7	13.8	15.2	13.4	14.3	13.8	14.1	—	8.8	14.4	14.0	14.1	13.4
RA-MW-17A	14.3	15.3	16.7	15.1	14.5	13.7	—	13.9	13.4	13.1	14.1	13.8	13.4	8.5	13.7	13.8	13.8	13.0
W85-6A	14.1	14.1	15.5	14.0	—	—	13.7	15.3	13.9	13.2	13.6	14.1	13.2	8.7	15.7	14.4	15.2	14.3
W85-6B	13.6	13.8	16.3	13.7	—	—	13.8	15.1	13.1	13.1	13.8	15.0	12.9	8.6	16.6	14.5	15.0	14.2
W92-16A	14.2	15.6	16.1	15.3	14.0	13.8	14.1	15.5	13.6	13.3	14.5	14.5	13.3	8.6	14.8	14.3	15.1	13.9
W92-16B	14.1	14.7	16.2	15.2	13.7	13.7	13.8	15.4	13.1	13.3	14.4	14.6	13.0	8.7	14.6	14.0	15.0	13.4
W97-18A	11.3	11.0	15.0	12.7	13.9	12.0	—	13.8	13.0	11.6	12.5	13.2	13.0	7.8	13.7	13.6	14.5	13.8
W97-19A	12.5	13.3	16.0	14.3	13.8	12.9	—	15.3	13.9	13.8	14.1	14.3	13.3	8.7	14.9	14.3	14.9	14.1
W97-19B	12.7	13.3	15.9	15.3	13.3	12.4	—	15.2	13.0	14.2	14.4	14.5	12.9	8.8	14.1	14.2	15.0	14.0
W98-21A	13.1	14.3	14.2	13.8	13.9	13.8	13.7	15.0	13.7	13.7	14.0	14.5	12.3	8.4	17.1	14.1	14.5	14.1
W98-21B	13.1	13.6	14.0	13.8	13.7	13.0	13.7	14.7	13.4	13.5	14.2	14.5	13.2	8.5	16.7	13.8	14.7	13.7
W99-R5A	14.2	14.9	15.7	14.8	14.8	14.7	15.1	—	13.9	13.9	15.5	15.4	14.1	10.0	14.7	14.3	14.8	14.1
W99-R5B	13.9	14.4	15.6	14.4	14.5	13.9	14.7	—	13.5	13.5	15.0	15.2	13.6	9.5	15.1	14.2	14.4	13.9
RA-MW-11A	15.7	16.5	17.4	15.7	15.0	15.1	15.1	14.9	13.7	13.8	14.0	14.0	13.5	—	—	—	—	—
RA-MW-11B	14.9	16.3	17.0	15.6	14.9	14.7	14.7	14.7	13.4	13.6	14.1	14.3	13.2	—	—	—	—	—
RA-MW-13A	15.0	14.6	15.7	14.9	14.5	14.3	13.7	14.1	12.8	13.8	14.3	14.3	13.2	—	—	—	—	—
RA-MW-13B	14.8	14.7	15.4	14.9	14.2	14.3	14.1	14.2	13.0	13.9	14.2	13.8	13.2	—	—	—	—	—
RA-MW-13C	14.2	15.0	14.9	14.5	14.3	13.8	13.8	14.1	12.4	13.9	14.0	14.0	12.9	—	—	—	—	—
RA-MW-14A	13.9	14.3	15.3	14.6	14.7	10.8	—	13.6	12.7	10.8	13.0	13.2	12.9	—	—	—	—	—
RA-MW-14B	14.0	14.9	15.5	14.5	14.1	12.3	—	14.0	12.8	11.3	13.8	13.5	12.9	—	—	—	—	—
W85-7A	11.4	12.6	14.9	13.9	14.5	12.3	13.7	15.9	13.4	12.7	13.4	—	14.5	—	—	—	—	—
W85-7B	12.1	13.0	14.5	13.6	14.1	12.8	13.4	14.4	13.0	13.0	13.4	—	13.4	—	—	—	—	—
W97-18B	11.4	12.4	14.4	13.5	13.0	10.7	—	13.8	12.6	12.0	13.6	—	—	—	—	—	—	—
W98-20A	13.8	12.5	15.4	14.3	14.3	13.1	—	15.3	14.0	13.1	13.6	—	13.2	—	—	—	—	—

(Table 3 continued)

Well Number	Specific Conductivity (mS/cm)																	
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Mar-07	Jun-07	Sep-07	Dec-07	Sep-08	Sep-09	Sep-10	Sep-11	Oct-12
B85-3	0.99	0.90	0.98	0.81	0.54	0.74	0.64	0.72	0.97	0.84	0.68	0.77	0.90	0.81	0.77	0.72	0.65	0.88
B85-4	0.41	1.17	0.51	0.71	0.28	0.74	0.33	0.56	0.92	739.00	0.60	—	0.43	0.63	0.58	0.55	0.34	0.42
B87-8	0.26	0.55	0.36	0.29	0.24	0.38	0.27	0.36	0.44	0.39	0.19	0.33	0.36	0.27	0.32	0.45	0.31	0.39
RA-MW-12A	6.01	5.40	4.00	3.32	2.52	2.47	2.37	2.26	2.95	0.85	1.11	1.98	2.34	2.55	2.92	2.59	2.55	2.27
RA-MW-12B	2.25	1.19	1.52	2.56	2.47	1.34	1.39	1.19	2.12	1.12	0.89	1.55	1.49	1.55	1.74	1.11	0.78	0.86
RA-MW-12C	2.18	1.34	1.13	0.68	1.09	0.69	0.88	0.53	1.05	0.65	0.49	0.58	0.81	0.80	0.97	0.72	0.54	0.56
RA-MW-15A	1.88	1.04	1.08	1.30	1.42	1.53	1.44	1.27	1.74	1.10	1.06	1.06	1.28	1.03	1.04	0.99	0.89	1.11
RA-MW-15B	0.47	0.86	0.68	0.64	0.91	0.92	0.80	0.46	1.60	1.16	0.49	0.81	1.22	0.93	0.85	0.49	0.33	0.39
RA-MW-16A	2.95	1.46	2.00	1.70	1.07	1.04	1.01	0.80	1.13	1.02	0.83	0.91	—	0.93	1.04	0.89	0.83	0.92
RA-MW-16B	2.42	1.19	1.40	1.81	0.92	0.67	0.51	0.43	1.34	1.05	0.32	0.48	—	0.74	0.66	0.49	0.50	0.78
RA-MW-17A	1.80	1.80	1.80	1.39	1.18	1.30	—	1.18	1.30	1.04	1.03	1.16	1.47	1.46	1.43	1.23	0.96	1.05
W85-6A	0.11	0.33	0.34	299.00	—	—	0.23	0.24	0.24	0.36	0.27	0.32	0.30	0.27	0.24	0.26	0.22	0.25
W85-6B	0.31	0.41	0.33	0.26	—	—	0.10	0.11	0.17	0.24	0.19	0.20	0.26	0.32	0.22	0.19	0.18	0.22
W92-16A	0.33	0.25	0.27	0.23	0.24	0.28	0.28	0.37	0.47	0.57	0.47	0.53	0.64	0.61	0.48	0.36	0.36	0.34
W92-16B	1.17	1.37	0.95	0.66	0.09	0.34	0.42	0.32	0.61	0.57	0.25	0.44	0.60	0.50	0.15	0.21	0.27	0.27
W97-18A	0.11	0.09	0.11	0.08	0.10	0.19	—	0.15	0.16	0.16	0.10	0.14	0.18	0.23	0.21	0.19	0.16	0.17
W97-19A	0.25	0.26	0.28	0.23	0.23	0.19	—	0.21	0.26	0.24	0.19	0.22	0.26	0.30	0.30	0.26	0.24	0.25
W97-19B	0.26	0.26	0.29	0.22	0.06	0.19	—	0.20	0.28	0.23	0.19	0.21	0.25	0.30	0.09	0.26	0.24	0.26
W98-21A	0.16	0.23	0.29	0.45	0.19	0.19	0.22	0.25	0.29	0.29	0.27	0.27	0.09	0.29	0.30	0.28	0.22	0.25
W98-21B	0.24	0.27	0.27	0.25	0.18	0.22	0.21	0.24	0.32	0.31	0.21	0.26	0.27	0.29	0.26	0.30	0.20	0.27
W99-R5A	0.24	0.25	0.24	0.22	0.21	0.20	0.20	—	0.27	0.22	0.21	0.21	0.20	0.27	0.28	0.26	0.22	0.25
W99-R5B	0.26	0.26	0.27	0.23	0.22	0.22	0.22	—	0.28	0.24	0.21	0.22	0.26	0.29	0.27	0.25	0.23	0.25
RA-MW-11A	1.67	1.89	2.02	1.48	1.82	2.01	1.46	1.70	2.21	1.75	1.22	1.62	1.99	—	—	—	—	—
RA-MW-11B	1.49	2.08	2.02	1.72	2.25	1.17	0.94	1.10	1.50	1.21	0.77	1.05	1.59	—	—	—	—	—
RA-MW-13A	5.21	2.42	3.29	2.83	2.49	2.17	1.66	1.13	2.33	1.34	1.23	1.47	1.69	—	—	—	—	—
RA-MW-13B	3.73	1.38	2.15	2.41	2.16	0.81	0.82	0.50	2.22	1.23	0.50	0.98	1.34	—	—	—	—	—
RA-MW-13C	3.07	1.82	1.41	1.28	0.71	0.79	0.82	0.57	1.36	0.93	0.51	0.60	0.93	—	—	—	—	—
RA-MW-14A	1.43	1.71	1.96	1.08	0.88	0.87	—	0.92	0.77	0.87	0.74	0.89	0.95	—	—	—	—	—
RA-MW-14B	1.56	1.21	0.98	1.08	1.00	0.78	—	0.69	0.89	0.87	0.68	0.85	1.02	—	—	—	—	—
W85-7A	0.13	0.14	0.21	0.12	0.11	0.10	0.16	0.16	0.13	219.00	0.11	—	0.27	—	—	—	—	—
W85-7B	0.28	0.31	0.32	0.01	0.01	0.01	0.02	0.01	0.03	0.01	0.02	—	0.02	—	—	—	—	—
W97-18B	0.26	0.24	0.27	0.22	0.19	0.19	—	0.19	0.28	0.23	0.17	—	—	—	—	—	—	—
W98-20A	0.16	0.15	0.23	0.12	0.12	0.13	—	0.18	0.25	0.18	0.16	—	0.26	—	—	—	—	—



(Table 3 continued)

Well Number	Dissolved Oxygen (mg/L)																	
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Mar-07	Jun-07	Sep-07	Dec-07	Sep-08	Sep-09	Sep-10	Sep-11	Oct-12
B85-3	1.11	0.16	1.57	4.50	0.12	2.97	0.22	1.04	0.80	0.02	0.24	0.15	0.21	0.18	0.39	0.27	0.62	0.28
B85-4	0.65	1.37	1.50	0.33	0.20	0.22	0.52	1.61	0.30	0.03	0.27	—	0.24	0.26	0.40	0.34	0.55	0.38
B87-8	0.13	1.03	1.06	0.35	0.28	0.53	0.37	0.52	0.25	0.01	7.00	0.19	0.11	0.24	0.40	0.17	0.62	0.42
RA-MW-12A	0.24	0.09	0.20	0.13	0.04	0.00	52.70	17.00	56.41	0.00	0.00	-0.47	0.00	0.00	0.51	1.96	1.28	2.88
RA-MW-12B	0.27	0.07	0.27	0.07	0.05	1.26	45.10	12.16	73.22	0.00	9.82	-0.39	0.00	0.00	0.40	0.23	0.27	0.20
RA-MW-12C	0.20	0.14	0.42	0.25	0.07	1.10	5.16	4.93	3.33	0.01	0.40	0.23	0.00	0.28	0.53	0.20	0.18	0.49
RA-MW-15A	0.33	0.21	1.53	0.47	0.15	8.34	0.47	2.89	0.29	0.04	0.19	0.48	0.10	0.32	0.48	0.32	0.56	0.42
RA-MW-15B	0.22	0.10	0.74	0.44	0.18	0.79	0.30	1.25	0.30	0.06	0.15	0.18	0.12	0.30	0.60	0.26	0.54	0.19
RA-MW-16A	0.73	0.27	1.39	1.60	0.11	5.40	0.54	0.49	0.31	0.05	0.36	0.31	—	0.15	0.43	0.31	0.65	0.43
RA-MW-16B	0.75	0.15	0.86	0.75	0.33	1.85	0.27	0.27	0.21	0.05	0.24	0.16	—	0.19	0.33	0.25	0.36	0.17
RA-MW-17A	0.60	0.19	1.99	0.60	0.20	3.69	—	0.74	0.35	0.11	0.14	0.22	0.10	0.19	0.51	0.32	0.45	0.37
W85-6A	4.92	0.43	0.85	4.90	—	—	1.86	2.06	2.63	0.09	0.51	0.93	2.52	2.08	4.01	2.97	3.51	5.07
W85-6B	3.46	6.13	6.54	5.50	—	—	7.87	3.83	5.15	0.05	4.96	5.95	6.10	4.87	13.98	10.48	9.20	10.86
W92-16A	0.98	0.13	2.49	3.10	0.28	0.15	0.45	0.32	0.33	0.13	0.32	0.22	0.11	0.15	0.54	0.28	0.48	0.24
W92-16B	0.14	0.53	1.97	3.40	5.40	1.02	0.54	2.12	0.23	0.80	4.16	1.60	0.11	1.31	14.02	10.90	8.21	9.27
W97-18A	1.27	0.74	1.09	0.50	1.10	4.00	—	1.45	0.90	0.90	0.67	0.69	0.69	0.64	0.33	0.19	0.66	1.00
W97-19A	4.72	1.79	22.73	4.60	0.97	3.51	—	3.50	9.37	1.00	3.74	3.57	4.69	3.92	6.56	2.42	3.67	2.85
W97-19B	1.81	1.31	2.60	2.60	1.10	2.99	—	3.43	4.13	0.52	2.83	3.55	3.44	3.01	9.81	1.67	4.06	2.80
W98-21A	1.29	1.49	3.03	13.30	1.20	1.05	3.26	2.59	4.97	0.07	0.80	2.44	2.53	2.58	3.18	2.81	3.52	4.53
W98-21B	1.24	3.29	2.82	17.70	3.90	1.08	3.37	2.42	4.90	0.02	3.52	1.98	2.73	2.58	8.21	2.60	7.13	4.92
W99-R5A	4.72	4.26	5.60	5.30	3.30	1.83	5.10	—	6.26	4.90	4.53	4.55	5.38	5.40	6.33	5.10	5.13	4.38
W99-R5B	3.97	2.71	4.70	5.10	1.90	2.03	4.20	—	4.90	3.40	3.49	3.86	4.66	4.34	5.76	5.03	4.55	4.86
RA-MW-11A	0.32	0.10	0.66	6.69	0.16	0.00	24.20	22.50	1.80	0.00	0.13	-0.12	0.00	—	—	—	—	—
RA-MW-11B	0.19	0.15	0.50	0.14	0.10	0.19	26.60	4.44	2.50	0.00	0.81	0.15	0.00	—	—	—	—	—
RA-MW-13A	1.63	0.17	1.13	0.53	0.11	0.38	0.27	1.00	0.00	0.04	0.24	0.20	0.11	—	—	—	—	—
RA-MW-13B	0.73	0.16	0.73	0.51	0.21	0.45	0.35	0.49	0.00	0.09	0.14	0.51	0.09	—	—	—	—	—
RA-MW-13C	0.22	0.15	0.43	1.40	2.98	0.96	0.41	0.80	0.00	0.06	0.46	0.26	0.07	—	—	—	—	—
RA-MW-14A	0.89	0.22	5.96	0.51	0.22	6.74	—	0.88	1.75	0.60	0.21	0.17	0.11	—	—	—	—	—
RA-MW-14B	1.08	0.10	2.77	0.42	0.12	2.58	—	0.52	1.73	0.90	0.13	0.20	0.10	—	—	—	—	—
W85-7A	4.05	3.17	2.18	4.30	2.20	6.70	5.89	3.09	2.39	0.18	3.29	—	2.60	—	—	—	—	—
W85-7B	2.78	5.11	6.10	8.70	4.00	10.30	10.96	3.77	0.06	0.10	8.79	—	7.85	—	—	—	—	—
W97-18B	2.01	5.56	4.52	4.90	2.00	1.17	—	4.25	4.59	1.09	4.72	—	—	—	—	—	—	—
W98-20A	4.92	3.76	5.50	5.00	3.20	5.10	—	3.63	9.14	5.70	3.03	—	4.87	—	—	—	—	—

(Table 3 continued)

Well Number	pH																	
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Mar-07	Jun-07	Sep-07	Dec-07	Sep-08	Sep-09	Sep-10	Sep-11	Oct-12
B85-3	6.49	6.68	6.91	6.39	6.70	6.64	6.42	6.33	6.73	6.68	6.66	6.88	7.02	6.88	6.74	6.85	5.82	6.82
B85-4	6.14	6.26	6.53	6.22	6.51	6.49	6.21	6.28	6.47	6.53	6.53	—	7.21	6.62	6.28	6.41	5.20	6.77
B87-8	6.55	6.31	6.73	6.54	6.68	6.57	6.35	6.61	6.71	6.71	6.89	6.99	7.44	6.90	6.90	6.63	6.14	6.79
RA-MW-12A	8.86	8.73	8.86	8.98	8.41	8.19	8.46	8.54	7.59	7.86	7.97	7.97	8.53	7.16	7.64	7.79	6.58	7.50
RA-MW-12B	7.77	7.83	7.92	8.30	8.68	8.16	7.76	7.83	8.06	7.94	7.55	7.79	8.28	7.75	7.25	7.31	6.43	7.40
RA-MW-12C	8.13	7.92	8.09	7.95	8.14	7.89	7.92	7.90	7.74	7.80	7.79	8.14	8.57	7.99	7.81	7.70	6.68	7.78
RA-MW-15A	6.35	6.37	6.74	6.20	6.30	6.47	6.28	6.09	6.53	6.61	6.50	6.68	7.19	6.63	6.53	6.51	5.80	6.53
RA-MW-15B	6.35	6.83	7.18	6.39	6.39	6.51	6.26	6.61	6.39	6.48	6.84	6.73	7.18	6.66	6.52	7.01	6.33	7.23
RA-MW-16A	6.61	6.61	6.75	6.42	6.44	6.62	6.44	5.96	6.68	6.71	6.64	6.82	—	6.74	6.62	6.56	4.35	6.54
RA-MW-16B	6.42	7.12	7.09	6.31	7.12	7.06	6.85	6.09	6.62	6.78	7.27	7.41	—	7.11	7.18	7.28	5.43	6.83
RA-MW-17A	6.55	6.43	6.61	6.20	6.39	6.50	—	6.42	6.66	6.59	6.47	6.69	7.26	6.65	6.68	6.55	5.57	6.52
W85-6A	6.23	6.22	6.40	6.36	—	—	6.25	5.47	6.63	6.47	6.50	6.77	6.85	6.71	6.24	6.52	6.07	6.54
W85-6B	6.40	6.42	6.68	6.62	—	—	8.93	7.16	8.05	6.83	6.76	7.15	7.09	6.87	8.50	9.12	7.80	7.65
W92-16A	6.42	6.42	6.72	6.60	6.56	6.60	6.67	5.87	6.59	6.52	6.44	6.75	7.41	6.61	6.40	6.56	5.47	6.60
W92-16B	7.51	7.58	7.63	7.59	6.88	7.54	7.38	6.35	7.46	7.62	7.51	7.70	8.23	7.21	7.22	7.17	5.93	6.93
W97-18A	5.83	5.96	6.19	6.17	6.78	6.57	—	5.08	6.29	6.32	6.23	6.54	7.07	6.33	6.33	6.30	5.20	6.25
W97-19A	6.35	6.24	6.28	6.35	6.59	6.41	—	5.53	6.55	6.58	6.57	6.91	7.33	6.51	6.35	6.53	3.30	6.55
W97-19B	6.68	6.49	6.30	6.47	6.68	6.68	—	5.89	6.83	6.76	6.72	6.95	7.50	6.65	7.14	6.78	4.94	6.70
W98-21A	5.92	6.07	6.68	6.18	6.30	6.25	6.11	4.80	6.16	6.43	6.34	6.53	6.81	6.48	6.07	6.25	5.62	6.34
W98-21B	6.04	6.07	6.90	6.24	6.64	6.36	6.07	5.55	6.38	6.39	6.46	6.48	7.08	6.44	6.19	6.38	5.34	6.49
W99-R5A	6.03	5.98	6.28	6.21	6.22	6.28	6.23	—	6.40	6.30	6.18	6.58	6.73	6.31	6.52	6.35	5.60	6.40
W99-R5B	6.20	6.23	6.55	6.33	6.63	6.55	6.26	—	6.62	6.63	6.54	6.90	6.92	6.54	6.66	6.67	5.95	6.64
RA-MW-11A	7.51	7.53	7.00	6.52	6.64	6.64	6.46	6.48	6.43	6.69	6.68	6.86	7.26	—	—	—	—	—
RA-MW-11B	7.66	7.90	7.20	6.70	6.73	7.00	6.69	6.85	6.86	7.01	6.94	7.17	7.61	—	—	—	—	—
RA-MW-13A	7.15	7.15	7.03	6.70	6.86	6.82	6.82	6.96	7.02	7.08	6.95	7.11	7.21	—	—	—	—	—
RA-MW-13B	7.23	7.56	7.30	6.86	6.99	7.15	6.95	7.52	7.04	7.06	7.43	7.35	7.27	—	—	—	—	—
RA-MW-13C	7.36	7.35	7.44	7.33	7.48	7.25	7.25	7.45	7.45	7.44	7.53	7.81	7.62	—	—	—	—	—
RA-MW-14A	6.64	6.81	6.99	6.50	6.60	6.60	—	5.98	6.76	6.65	6.62	6.89	6.85	—	—	—	—	—
RA-MW-14B	6.90	7.14	7.33	6.75	6.78	6.87	—	6.40	6.98	6.82	6.89	7.06	7.04	—	—	—	—	—
W85-7A	6.24	6.04	6.26	6.20	6.30	6.35	6.24	5.69	6.45	6.33	6.40	—	6.61	—	—	—	—	—
W85-7B	6.63	6.51	6.71	5.91	6.18	6.14	6.37	5.39	6.57	6.23	6.30	—	6.71	—	—	—	—	—
W97-18B	6.57	6.35	6.67	6.41	6.60	6.16	—	6.25	6.55	6.61	6.68	—	—	—	—	—	—	—
W98-20A	6.01	5.91	6.32	5.97	6.29	6.18	—	4.90	6.26	6.41	6.19	—	7.02	—	—	—	—	—

(Table 3 continued)

Well Number	ORP (mV)																	
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Mar-07	Jun-07	Sep-07	Dec-07	Sep-08	Sep-09	Sep-10	Sep-11	Oct-12
B85-3	-7	-107	-37	-47	-93	-62	-43	-53	-59	-43	-66	-30	-52	-39	27	-61	-50	-58
B85-4	10	41	59	218	-26	75	86	179	161	182	90	—	123	108	162	220	479	119
B87-8	-8	31	17	199	2	73	86	160	167	170	87	95	106	96	107	12	42	-17
RA-MW-12A	-468	-466	-430	-417	-403	-393	-363	-311	-373	-324	-374	-369	-396	-310	-154	-304	-333	-278
RA-MW-12B	-363	-321	-315	-415	-414	-345	-327	-355	-374	-313	-363	-361	-379	-318	-215	-283	-308	-214
RA-MW-12C	-282	-179	-154	-239	-314	-234	-191	-164	-217	-137	-129	-235	-289	-219	-167	-233	-275	-178
RA-MW-15A	-47	4	39	10	-12	-137	-28	-52	-24	13	-58	41	7	47	93	50	68	3
RA-MW-15B	-5	28	15	17	-11	16	34	76	32	48	-15	64	29	82	122	75	407	67
RA-MW-16A	-94	-45	-58	-156	-103	-160	-93	-125	-125	-112	-109	-21	—	-30	120	96	315	67
RA-MW-16B	-57	-70	-60	-85	-130	-131	-66	-155	-113	-88	-112	-43	—	-46	29	21	490	110
RA-MW-17A	-91	-40	-7	-5	-27	-89	—	-106	-34	-128	-79	74	-25	-11	-6	-39	54	-35
W85-6A	17	57	86	163	—	—	107	356	123	172	168	240	176	218	200	144	328	102
W85-6B	19	76	72	159	—	—	79	340	70	164	161	236	177	229	165	117	357	107
W92-16A	1	-14	30	110	110	-32	61	129	127	76	100	98	112	113	154	118	413	111
W92-16B	-116	-61	-60	73	119	-103	30	253	113	71	60	116	114	121	152	151	459	134
W97-18A	32	57	67	103	58	137	—	317	192	119	135	133	130	147	60	140	505	150
W97-19A	71	94	72	218	69	149	—	311	96	71	156	233	128	205	127	155	609	112
W97-19B	56	86	56	52	76	142	—	295	88	74	153	240	121	193	138	163	562	126
W98-21A	28	69	79	182	113	160	114	484	157	-55	165	243	135	228	183	196	453	155
W98-21B	33	72	47	202	121	161	117	471	148	111	161	249	140	226	188	194	486	156
W99-R5A	58	96	97	153	123	197	116	—	131	100	81	237	186	226	134	174	403	140
W99-R5B	58	78	74	201	92	204	111	—	122	92	90	239	180	213	167	162	414	141
RA-MW-11A	-384	-391	-316	-110	-241	-246	-216	-294	-671	-260	-263	-258	-259	—	—	—	—	—
RA-MW-11B	-394	-393	-332	-296	-289	-301	-278	-317	-303	-261	-287	-276	-313	—	—	—	—	—
RA-MW-13A	-155	-102	-97	-94	-204	-176	-93	-153	-121	-125	-144	-69	-101	—	—	—	—	—
RA-MW-13B	-129	-123	-104	-105	-125	-197	-85	-152	-125	-144	-166	-79	-99	—	—	—	—	—
RA-MW-13C	-136	-126	-116	-142	-33	-175	-112	-135	-137	-133	-143	-100	-140	—	—	—	—	—
RA-MW-14A	-77	-41	-54	-75	-82	-136	—	-80	-64	-104	-154	-25	-14	—	—	—	—	—
RA-MW-14B	-112	-95	-102	-112	-134	-133	—	-98	-144	-141	-129	-57	-64	—	—	—	—	—
W85-7A	68	83	57	197	116	113	127	246	131	186	160	—	175	—	—	—	—	—
W85-7B	59	73	66	215	132	146	167	259	141	187	161	—	189	—	—	—	—	—
W97-18B	57	63	60	188	83	152	—	233	187	123	118	—	—	—	—	—	—	—
W98-20A	52	116	84	219	116	171	—	366	143	91	166	—	153	—	—	—	—	—

(Table 3 continued)

Well Number	Sulfur (mg/L)																	
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Mar-07	Jun-07	Sep-07	Dec-07	Sep-08	Sep-09	Sep-10	Sep-11	Oct-12
B85-4	23	150	31	87	20	103	21	59	67	59	75	—	23	39	32	33	13	20
B87-8	9	52	22	17	23	48	21	42	31	34	43	28	24	14	17	35	12	22
W85-6A	—	15	14	18	—	—	12	15	7	26	19	19	10	9	6	7	7	8
W98-21A	—	—	—	—	8	10	—	—	—	—	—	—	—	—	—	—	—	—
W99-R5A	5	6	4	5	6	7	6	5	5	5	5	5	6	6	6	5	5	5
RA-MW-11A	286	296	304	285	460	448	322	402	342	311	304	311	345	—	—	—	—	—
RA-MW-13A	743	246	324	372	363	310	213	111	207	107	130	148	122	—	—	—	—	—
RA-MW-14A	189	228	214	136	122	158	124	140	72	107	117	113	103	—	—	—	—	—
W85-7A	3	4	5	4	4	3	5	6	3	10	4	—	7	—	—	—	—	—
Well Number	Sulfate (mg/L)																	
	Feb-04	Apr-04	Aug-04	May-05	Dec-05	Mar-06	Jun-06	Sep-06	Dec-06	Mar-07	Jun-07	Sep-07	Dec-07	Sep-08	Sep-09	Sep-10	Sep-11	Oct-12
B85-4	58	410	104	222	50	253	75	169	212	201	195	—	60	107	95	97	38	55
B87-8	21	137	73	170	63	125	74	117	98	113	120	87	61	39	54	102	35	63
W85-6A	5	36	44	44	—	—	35	41	21	85	51	59	27	20	19	20	22	22
W98-21A	—	—	—	—	19	25	—	—	—	—	—	—	—	—	—	—	—	—
W99-R5A	12	12	13	15	13	15	18	14	14	16	14	15	16	17	19	15	16	15
RA-MW-11A	620	751	1040	736	1200	3040	993	1170	1120	954	795	995	989	—	—	—	—	—
RA-MW-13A	1960	712	1056	985	971	1980	682	323	657	362	331	451	342	—	—	—	—	—
RA-MW-14A	477	635	697	357	351	429	396	400	225	358	283	347	284	—	—	—	—	—
W85-7A	6	9	15	13	8	8	18	16	7	30	10	—	18	—	—	—	—	—
— mg/L mV mS/cm	= Not Analyzed = milligrams per liter = millivolts = milliSiemens per centimeter																	

**Table 4: Frontier Hard Chrome - Event 18 Ground Water Elevations - 15 October 2012**

Well Number	Time	Casing Elevation (ft AMSL)	Depth to Water (ft)	Water level Elevation (ft AMSL)
W85-3A	—	26.40	—	—
W85-3B	13:13	26.77	21.95	4.82
W97-18A <sup>1</sup>	13:39	24.66	19.89	4.77
B85-4 <sup>1</sup>	13:34	25.13	20.33	4.80
B87-8 <sup>1</sup>	13:29	25.79	20.98	4.81
W92-16B	13:19	25.51	20.77	4.74
W92-16A	13:17	25.62	20.89	4.73
B85-3 <sup>1</sup>	13:24	24.90	20.07	4.83
W85-7A <sup>1</sup>	12:43	26.22	21.53	4.69
W85-7B <sup>1</sup>	12:44	26.41	21.73	4.68
W97-19A <sup>2,3</sup>	12:24	22.45	17.84	4.61
W97-19B <sup>2,3</sup>	12:25	21.72	17.16	4.56
W98-20A <sup>1,3</sup>	12:36	26.62	21.74	4.88
W85-6A <sup>1</sup>	13:03	25.90	21.17	4.73
W85-6B <sup>1</sup>	13:04	25.85	21.10	4.75
W98-21B <sup>1</sup>	12:55	27.05	22.31	4.74
W98-21A <sup>1</sup>	12:53	26.79	22.11	4.68
W99-R5A	12:09	32.26	27.66	4.60
W99-R5B	12:11	32.33	27.72	4.61
USGS 14144700 <sup>4</sup>	Daily Average for 10/15/2012			4.60

1 = Casing elevation surveyed by Minister-Glaeser Surveying Inc. on November 30, 2007

2 = Two different elevation datum's have been used at Frontier Hard Chrome. Weston (12/03) Long-Term Monitoring plan has applied a correction factor (+3.76 feet) using the City of Vancouver's benchmark #108 located near FHC site.

3 = anomalous groundwater elevation measurement, not used in flow direction and gradient calculations

4 = Stage height of the Columbia River corrected to the NGVD 1929 (add 1.82 feet) for October 15, 2012

AMSL = Above Mean Sea Level

ft = feet

USGS = United States Geological Survey

— = Could not measure water level elevation due to well not having been located.

**Table 5: Quality Assurance Sample Results**

Well Number	Duplicate Sample ID	Original Sample Concentration	Duplicate Sample Concentration	Relative Percent Difference
<b>Total Chromium (µg/L) (unfiltered)</b>				
B85-4	QA-2	2.50 U	2.50 U	—
RA-MW-15B	QA-3	2.50 U	2.50 U	—
RA-MW-12A	QA-4	61.9	73.3	16.9
<b>Dissolved Chromium (µg/L) (field filtered)</b>				
RA-MW-15B	QA-3	5.00 U	5.00 U	—
<b>Sulfate (mg/L)</b>				
W85-6A	QA-1	22.2	22.1	0.5

mg/L = milligrams per liter  
 U = analyte not detected above laboratory reporting limit  
 µg/L = micrograms per liter  
 — = not calculable



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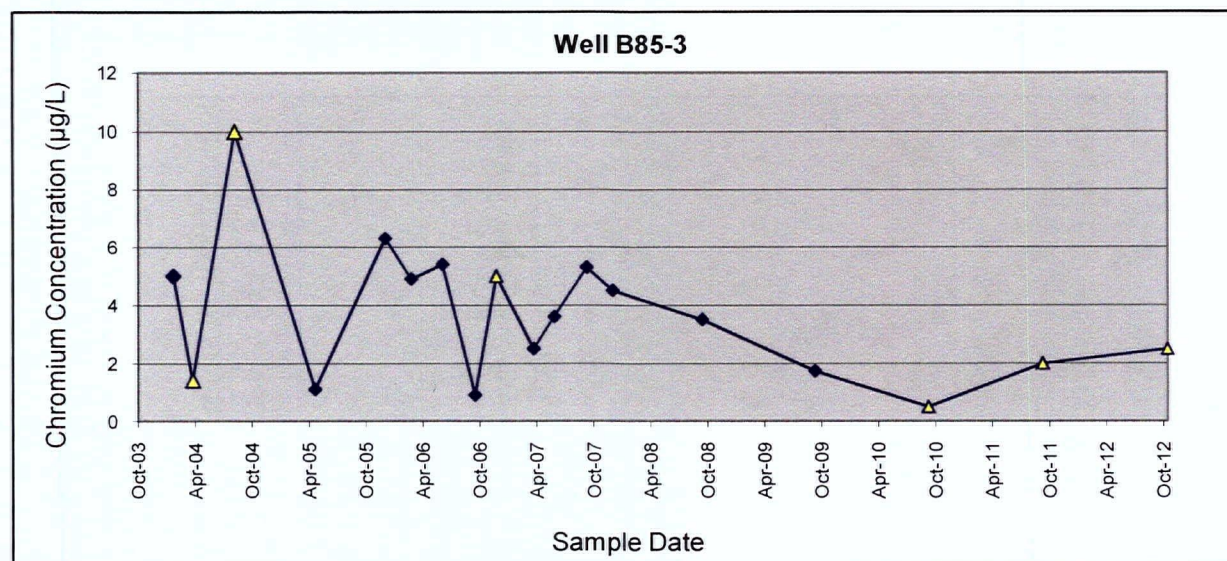
**APPENDIX A**

**GROUNDWATER CHROMIUM CONCENTRATION TRENDS**



# Well B85-3

Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH0	Water	05-Feb-04	Chromium	5	µg/L	J	B85-3	Total	1.00
MJ2BJ6	Water	07-Apr-04	Chromium	1.4	µg/L	U	B85-3	Total	3.00
MJ4732	Water	18-Aug-04	Chromium	10	µg/L	U	B85-3	Total	0.00
184232	Water	03-May-05	Chromium	1.1	µg/L		B85-3	Total	2.80
05504298	Water	13-Dec-05	Chromium	6.3	µg/L		B85-3	Total	8.10
104235	Water	06-Mar-06	Chromium	4.9	µg/L		B85-3	Total	7.00
244311	Water	14-Jun-06	Chromium	5.4	µg/L		B85-3	Total	6.00
394197	Water	26-Sep-06	Chromium	0.9	µg/L		B85-3	Total	1.00
494094	Water	03-Dec-06	Chromium	5	µg/L	U	B85-3	Total	7.00
134266	Water	01-Apr-07	Chromium	2.5	µg/L		B85-3	Total	5.10
234092	Water	06-Jun-07	Chromium	3.6	µg/L		B85-3	Total	4.00
384551	Water	18-Sep-07	Chromium	5.3	µg/L		B85-3	Total	9.00
504141	Water	10-Dec-07	Chromium	4.5	µg/L		B85-3	Total	7.70
8394092	Water	21-Sep-08	Chromium	3.5	µg/L		B85-3	Total	7.10
90906513	Water	16-Sep-09	Chromium	1.73	µg/L		B85-3	Total	2.34
1009065-10	Water	14-Sep-10	Chromium	0.5	µg/L	U	B85-3	Total	0.55
1009064-11	Water	14-Sep-11	Chromium	2	µg/L	U	B85-3	Total	1.51
1210057-10	Water	16-Oct-12	Chromium	2.50	µg/L	U	B85-3	Total	0.44

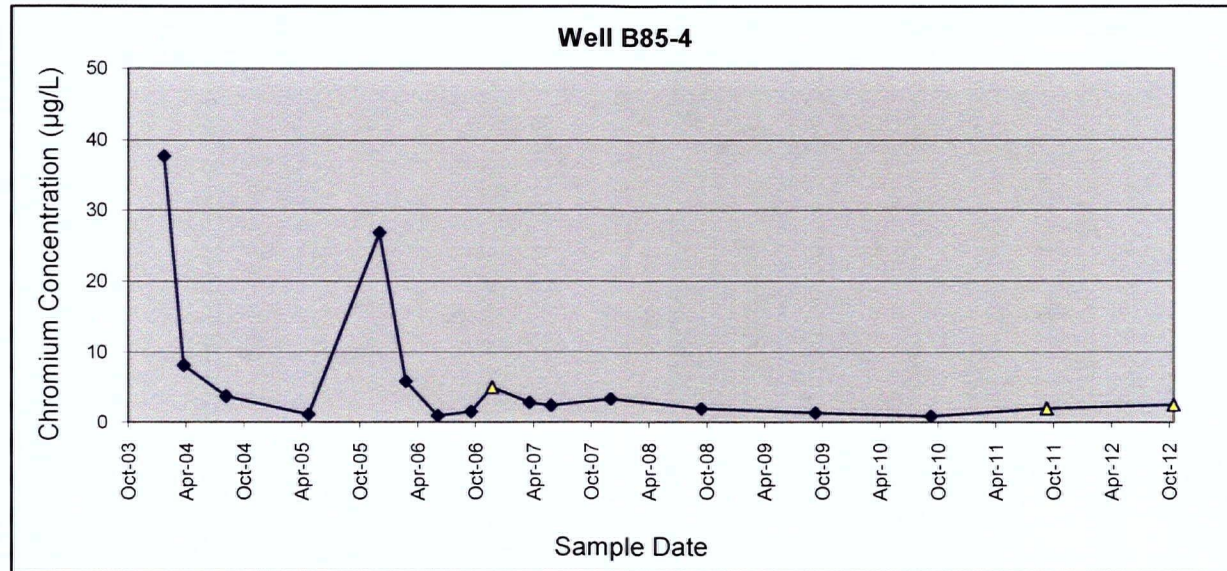


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



# Well B85-4

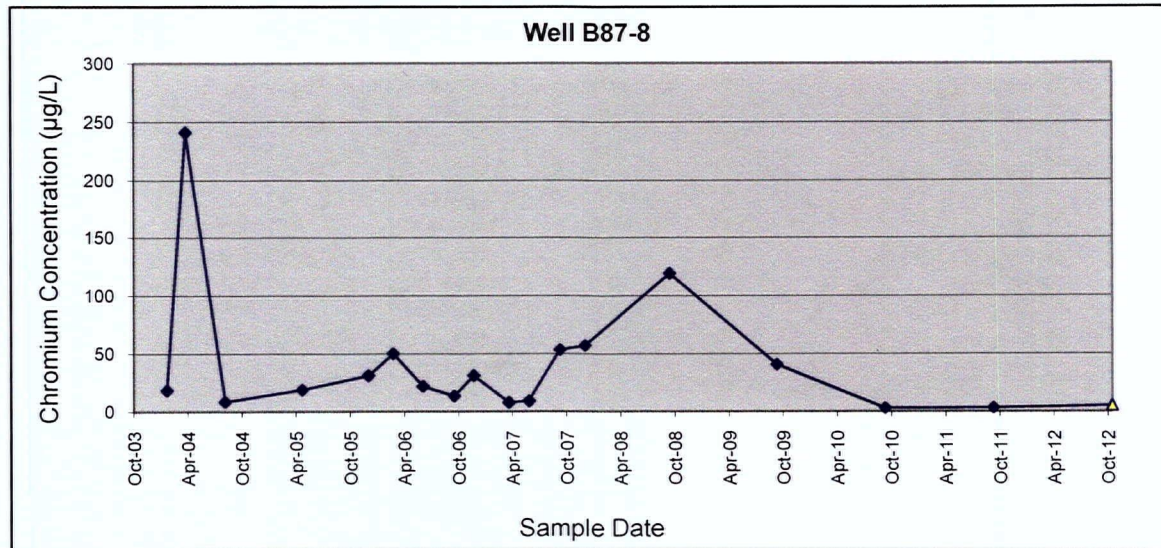
Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH4	Water	05-Feb-04	Chromium	37.7	µg/L		B85-4	Total	1.00
MJ2BK1	Water	07-Apr-04	Chromium	8.1	µg/L	J	B85-4	Total	0.00
MJ4738	Water	18-Aug-04	Chromium	3.7	µg/L	J	B85-4	Total	4.00
184246	Water	04-May-05	Chromium	1.1	µg/L		B85-4	Total	2.00
05504296	Water	13-Dec-05	Chromium	26.8	µg/L		B85-4	Total	5.70
104237	Water	06-Mar-06	Chromium	5.8	µg/L		B85-4	Total	3.90
244310	Water	14-Jun-06	Chromium	0.9	µg/L		B85-4	Total	0.30
394207	Water	27-Sep-06	Chromium	1.5	µg/L		B85-4	Total	1.00
494084	Water	02-Dec-06	Chromium	5	µg/L	U	B85-4	Total	0.00
134252	Water	30-Mar-07	Chromium	2.8	µg/L		B85-4	Total	1.40
234091	Water	06-Jun-07	Chromium	2.4	µg/L		B85-4	Total	2.10
504143	Water	11-Dec-07	Chromium	3.3	µg/L		B85-4	Total	1.40
8394097	Water	21-Sep-08	Chromium	1.9	µg/L		B85-4	Total	3.30
90906517	Water	15-Sep-09	Chromium	1.31	µg/L		B85-4	Total	0.71
1009065-08	Water	14-Sep-10	Chromium	0.86	µg/L		B85-4	Total	0.25
1009064-08	Water	13-Sep-11	Chromium	2	µg/L	U	B85-4	Total	1.11
1210057-11	Water	17-Oct-12	Chromium	2.50	µg/L	U	B85-4	Total	0.21



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

**Well B87-8**

<u>Sample Number</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Analyte</u>	<u>Conc.</u>	<u>Units</u>	<u>Qualifier</u>	<u>Station Location</u>	<u>Notes</u>	<u>NTU</u>
MJ2AG9	Water	04-Feb-04	Chromium	18.2	µg/L		B87-8	Total	2.00
MJ2BK0	Water	07-Apr-04	Chromium	241	µg/L		B87-8	Total	8.00
MJ4737	Water	18-Aug-04	Chromium	8.5	µg/L	J	B87-8	Dissolved	36.00
184247	Water	04-May-05	Chromium	18.8	µg/L		B87-8	Total	6.50
05504297	Water	13-Dec-05	Chromium	31	µg/L		B87-8	Total	5.10
104236	Water	06-Mar-06	Chromium	50	µg/L		B87-8	Total	8.00
244308	Water	14-Jun-06	Chromium	21.8	µg/L		B87-8	Total	3.00
394204	Water	27-Sep-06	Chromium	13.4	µg/L		B87-8	Dissolved	13.00
494082	Water	02-Dec-06	Chromium	31	µg/L		B87-8	Total	0.10
134251	Water	30-Mar-07	Chromium	7.8	µg/L		B87-8	Dissolved	11.00
234089	Water	06-Jun-07	Chromium	9.2	µg/L		B87-8	Dissolved	0.90
384552	Water	18-Sep-07	Chromium	53.3	µg/L		B87-8	Dissolved	2.10
504144	Water	11-Dec-07	Chromium	56.9	µg/L		B87-8	Dissolved	8.40
8394098	Water	21-Sep-08	Chromium	119	µg/L		B87-8	Dissolved	13.00
90906520	Water	16-Sep-09	Chromium	40.5	µg/L		B87-8	Dissolved	16.70
1009065-20	Water	15-Sep-10	Chromium	2.71	µg/L		B87-8	Dissolved	6.60
1009064-10	Water	14-Sep-11	Chromium	3	µg/L		B87-8	Dissolved	2.54
1210057-13	Water	17-Oct-12	Chromium	5.00	µg/L	U	B87-8	Dissolved	7.47

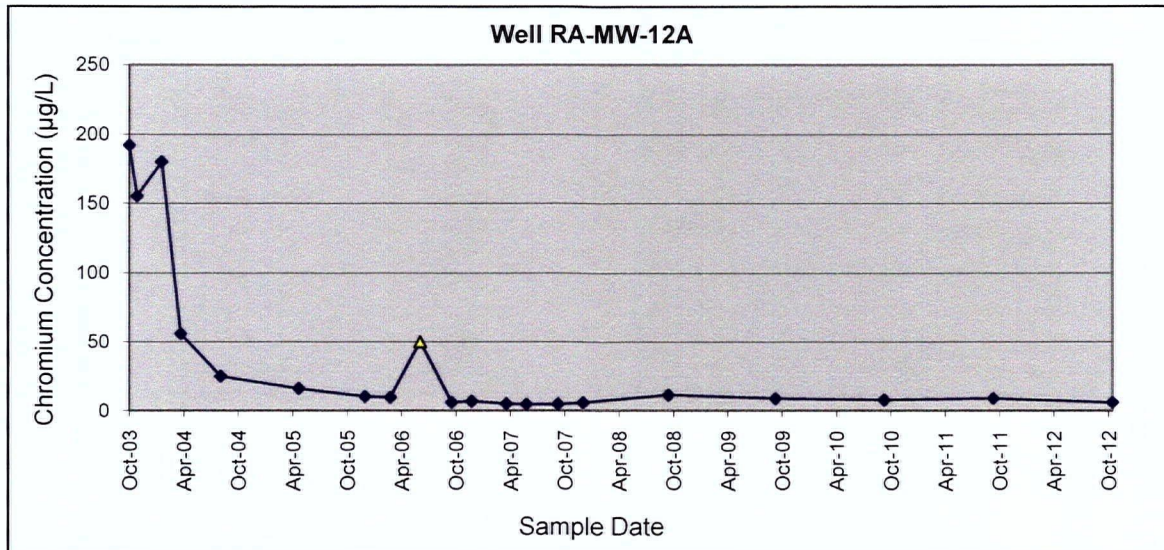


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



# Well RA-MW-12A

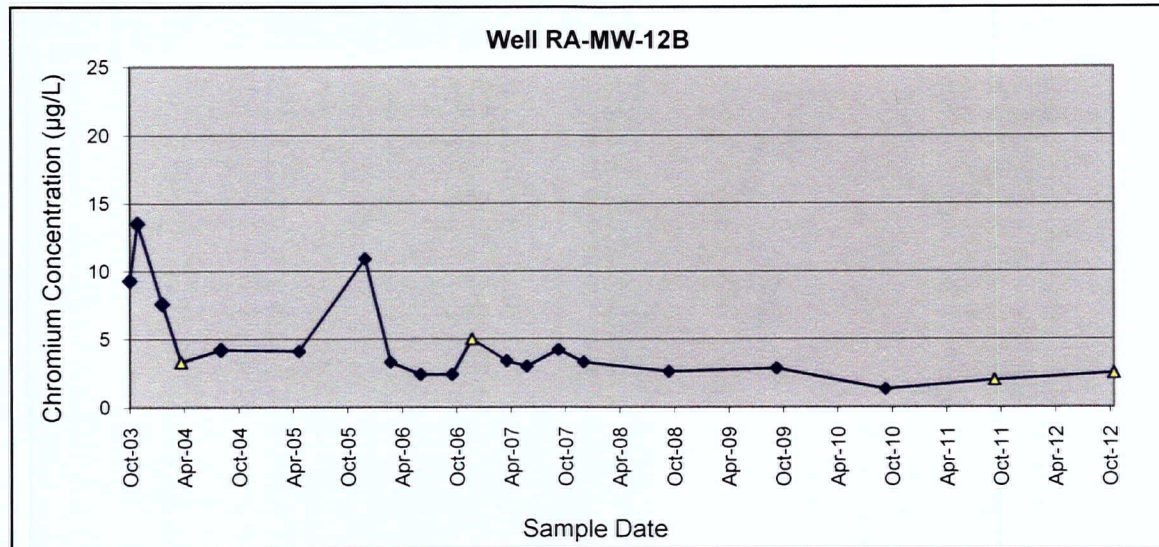
Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2524	Water	17-Oct-03	Chromium	192	µg/L		RA-MW-12A	Dissolved	>10
MJ27F5	Water	12-Nov-03	Chromium	155	µg/L		RA-MW-12A	Dissolved	>10
MJ2AF0	Water	02-Feb-04	Chromium	180	µg/L		RA-MW-12A	Total	7.00
MJ2BH9	Water	06-Apr-04	Chromium	55.8	µg/L		RA-MW-12A	Dissolved	17.00
MJ4725	Water	17-Aug-04	Chromium	24.9	µg/L		RA-MW-12A	Dissolved	12.00
184253	Water	05-May-05	Chromium	16	µg/L		RA-MW-12A	Dissolved	32.00
05504282	Water	12-Dec-05	Chromium	10.2	µg/L		RA-MW-12A	Dissolved	86.00
104243	Water	07-Mar-06	Chromium	9.6	µg/L		RA-MW-12A	Dissolved	60.00
244313	Water	15-Jun-06	Chromium	50	µg/L	U	RA-MW-12A	Dissolved	47.00
394218	Water	28-Sep-06	Chromium	6.0	µg/L		RA-MW-12A	Dissolved	80.00
494110	Water	04-Dec-06	Chromium	6.8	µg/L		RA-MW-12A	Dissolved	12.00
134255	Water	30-Mar-07	Chromium	5.0	µg/L		RA-MW-12A	Dissolved	85.00
234081	Water	05-Jun-07	Chromium	4.6	µg/L		RA-MW-12A	Dissolved	55.00
384560	Water	19-Sep-07	Chromium	4.7	µg/L		RA-MW-12A	Dissolved	11.00
504161	Water	12-Dec-07	Chromium	5.7	µg/L		RA-MW-12A	Dissolved	60.00
8394103	Water	22-Sep-08	Chromium	11.2	µg/L		RA-MW-12A	Dissolved	200.00
90906523	Water	16-Sep-09	Chromium	8.68	µg/L		RA-MW-12A	Dissolved	102.00
1009065-25	Water	15-Sep-10	Chromium	7.77	µg/L		RA-MW-12A	Dissolved	>10
1009064-24	Water	15-Sep-11	Chromium	9	µg/L		RA-MW-12A	Dissolved	40.00
1210057-25	Water	18-Oct-12	Chromium	6.08	µg/L		RA-MW-12A	Dissolved	12.10



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

**Well RA-MW-12B**

<u>Sample Number</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Analyte</u>	<u>Conc.</u>	<u>Units</u>	<u>Qualifier</u>	<u>Station Location</u>	<u>Notes</u>	<u>NTU</u>
MJ2526	Water	17-Oct-03	Chromium	9.3	µg/L	BJ	RA-MW-12B	Dissolved	>10
MJ27F7	Water	12-Nov-03	Chromium	13.5	µg/L		RA-MW-12B	Dissolved	>10
MJ2AF1	Water	02-Feb-04	Chromium	7.6	µg/L	J	RA-MW-12B	Total	6.00
MJ2BJ0	Water	06-Apr-04	Chromium	3.3	µg/L	U	RA-MW-12B	Total	0.00
MJ4726	Water	17-Aug-04	Chromium	4.2	µg/L	J	RA-MW-12B	Total	2.00
184254	Water	05-May-05	Chromium	4.1	µg/L		RA-MW-12B	Total	4.50
05504283	Water	12-Dec-05	Chromium	10.9	µg/L		RA-MW-12B	Total	8.00
104242	Water	07-Mar-06	Chromium	3.3	µg/L		RA-MW-12B	Total	1.70
244315	Water	15-Jun-06	Chromium	2.4	µg/L		RA-MW-12B	Total	14.00
394216	Water	28-Sep-06	Chromium	2.4	µg/L		RA-MW-12B	Total	1.00
494108	Water	04-Dec-06	Chromium	5	µg/L	U	RA-MW-12B	Total	2.00
134253	Water	30-Mar-07	Chromium	3.4	µg/L		RA-MW-12B	Total	2.20
234082	Water	05-Jun-07	Chromium	3.0	µg/L		RA-MW-12B	Total	1.10
384562	Water	19-Sep-07	Chromium	4.2	µg/L		RA-MW-12B	Total	0.80
504162	Water	12-Dec-07	Chromium	3.3	µg/L		RA-MW-12B	Total	0.60
8394105	Water	22-Sep-08	Chromium	2.6	µg/L		RA-MW-12B	Total	0.90
90906524	Water	17-Sep-09	Chromium	2.84	µg/L		RA-MW-12B	Total	0.97
1009065-24	Water	16-Sep-10	Chromium	1.32	µg/L		RA-MW-12B	Total	<10
1009064-22	Water	15-Sep-11	Chromium	2	µg/L	U	RA-MW-12B	Total	0.99
1210057-24	Water	18-Oct-12	Chromium	2.50	µg/L	U	RA-MW-12B	Total	0.79

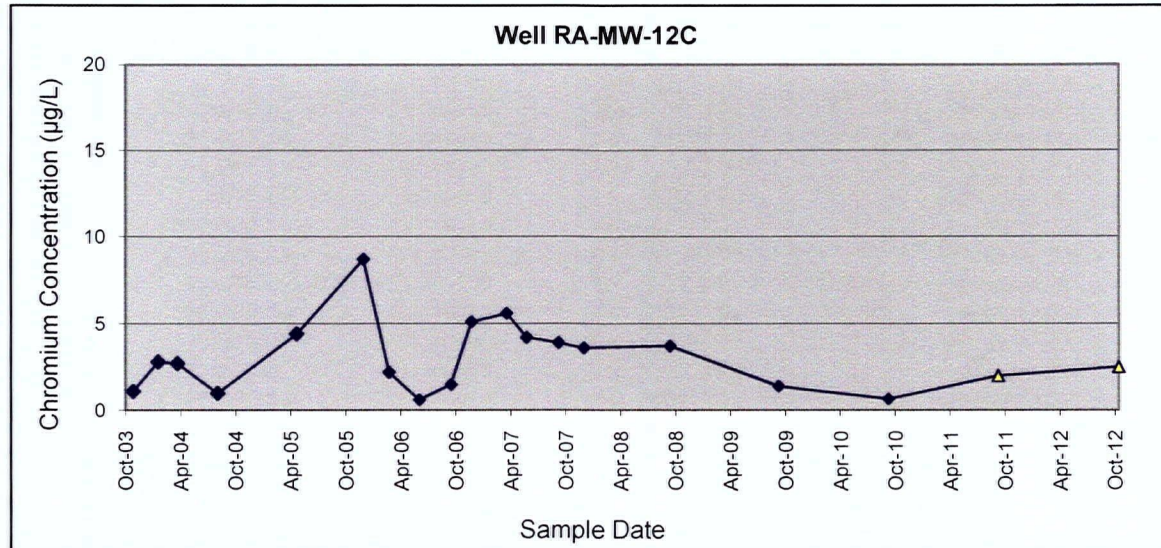


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



# Well RA-MW-12C

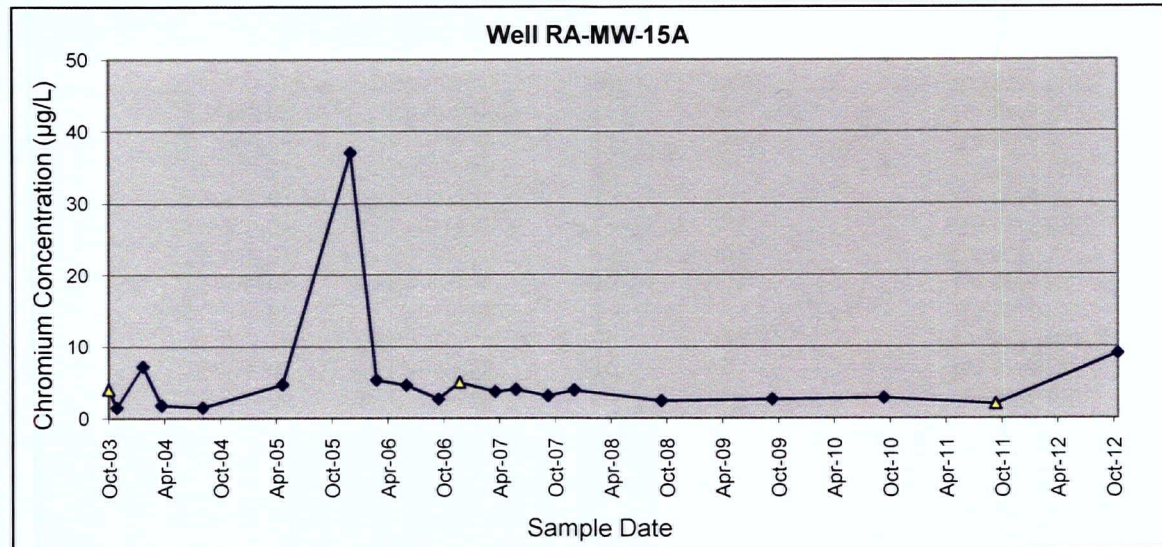
Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2528	Water	17-Oct-03	Chromium	3.3	µg/L	BJ	RA-MW-12C	Dissolved	>10
MJ27F9	Water	12-Nov-03	Chromium	1.1	µg/L	BJ	RA-MW-12C	Dissolved	>10
MJ2AF2	Water	03-Feb-04	Chromium	2.8	µg/L	J	RA-MW-12C	Total	1.00
MJ2BJ1	Water	06-Apr-04	Chromium	2.7	µg/L	J	RA-MW-12C	Total	0.00
MJ4727	Water	17-Aug-04	Chromium	0.98	µg/L	J	RA-MW-12C	Total	2.00
184255	Water	5-May-05	Chromium	4.4	µg/L		RA-MW-12C	Total	5.20
05504284	Water	12-Dec-05	Chromium	8.7	µg/L		RA-MW-12C	Total	3.00
104245	Water	7-Mar-06	Chromium	2.2	µg/L		RA-MW-12C	Total	1.00
244317	Water	15-Jun-06	Chromium	0.6	µg/L	J	RA-MW-12C	Total	0.30
394215	Water	28-Sep-06	Chromium	1.5	µg/L		RA-MW-12C	Total	0.40
494117	Water	4-Dec-06	Chromium	5.1	µg/L		RA-MW-12C	Total	3.00
134256	Water	31-Mar-07	Chromium	5.6	µg/L		RA-MW-12C	Total	3.40
234079	Water	5-Jun-07	Chromium	4.2	µg/L		RA-MW-12C	Total	1.90
384563	Water	19-Sep-07	Chromium	3.9	µg/L		RA-MW-12C	Total	2.90
504163	Water	12-Dec-07	Chromium	3.6	µg/L		RA-MW-12C	Total	3.30
8394106	Water	22-Sep-08	Chromium	3.7	µg/L		RA-MW-12C	Total	1.90
90906525	Water	17-Sep-09	Chromium	1.4	µg/L		RA-MW-12C	Total	1.55
1009065-23	Water	16-Sep-10	Chromium	0.66	µg/L		RA-MW-12C	Total	<10
1009064-23	Water	15-Sep-11	Chromium	2	µg/L	U	RA-MW-12C	Total	0.68
1210057-23	Water	18-Oct-12	Chromium	2.50	µg/L	U	RA-MW-12C	Total	0.30



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

# Well RA-MW-15A

Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2506	Water	15-Oct-03	Chromium	4	µg/L	U	RA-MW-15A	Total	<10
MJ27E8	Water	11-Nov-03	Chromium	1.5	µg/L	BJ	RA-MW-15A	Total	<10
MJ2AG7	Water	04-Feb-04	Chromium	7.2	µg/L	J	RA-MW-15A	Total	1.00
MJ2BH1	Water	05-Apr-04	Chromium	1.8	µg/L	J	RA-MW-15A	Total	0.00
MJ4722	Water	17-Aug-04	Chromium	1.5	µg/L	J	RA-MW-15A	Total	0.00
184248	Water	04-May-05	Chromium	4.7	µg/L		RA-MW-15A	Total	2.00
05504290	Water	13-Dec-05	Chromium	37	µg/L		RA-MW-15A	Total	1.30
104251	Water	07-Mar-06	Chromium	5.3	µg/L		RA-MW-15A	Total	0.00
244290	Water	12-Jun-06	Chromium	4.6	µg/L		RA-MW-15A	Total	0.60
394192	Water	25-Sep-06	Chromium	2.7	µg/L		RA-MW-15A	Total	0.20
494090	Water	02-Dec-06	Chromium	5.0	µg/L	U	RA-MW-15A	Total	2.00
134241	Water	29-Mar-07	Chromium	3.7	µg/L		RA-MW-15A	Total	0.30
234068	Water	04-Jun-07	Chromium	4.0	µg/L		RA-MW-15A	Total	0.50
384541	Water	17-Sep-07	Chromium	3.1	µg/L		RA-MW-15A	Total	0.40
504153	Water	12-Dec-07	Chromium	3.9	µg/L		RA-MW-15A	Total	1.10
8394093	Water	21-Sep-08	Chromium	2.4	µg/L		RA-MW-15A	Total	0.30
90906514	Water	17-Sep-09	Chromium	2.62	µg/L		RA-MW-15A	Total	1.32
1009065-19	Water	16-Sep-10	Chromium	2.82	µg/L		RA-MW-15A	Total	<10
1009064-16	Water	15-Sep-11	Chromium	2	µg/L	U	RA-MW-15A	Total	2.46
1210057-18	Water	18-Oct-12	Chromium	9.00	µg/L		RA-MW-15A	Total	0.18

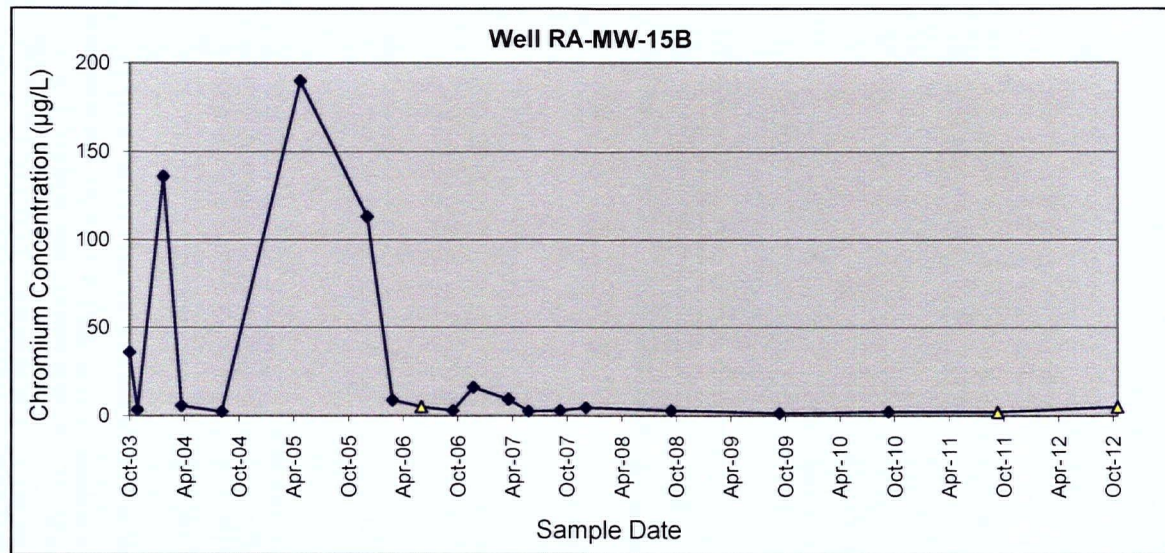


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



# Well RA-MW-15B

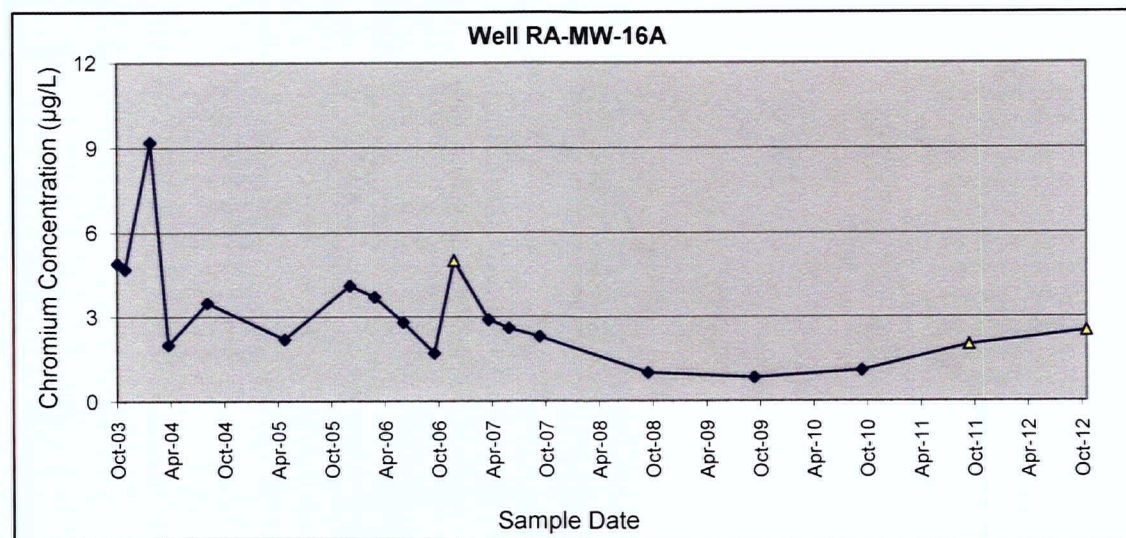
Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2507	Water	15-Oct-03	Chromium	35.8	µg/L		RA-MW-15B	Total	<10
MJ27E9	Water	11-Nov-03	Chromium	3.2	µg/L	BJ	RA-MW-15B	Total	<10
MJ2AG8	Water	04-Feb-04	Chromium	136	µg/L		RA-MW-15B	Total	2.00
MJ2BH2	Water	05-Apr-04	Chromium	5.5	µg/L	J	RA-MW-15B	Total	0.00
MJ4723	Water	17-Aug-04	Chromium	2.2	µg/L	J	RA-MW-15B	Total	1.00
184249	Water	04-May-05	Chromium	190	µg/L		RA-MW-15B	Total	9.70
05504288	Water	13-Dec-05	Chromium	113	µg/L		RA-MW-15B	Total	3.50
104252	Water	08-Mar-06	Chromium	8.7	µg/L		RA-MW-15B	Dissolved	5.00
244292	Water	12-Jun-06	Chromium	5	µg/L	U	RA-MW-15B	Dissolved	4.00
394190	Water	25-Sep-06	Chromium	2.8	µg/L		RA-MW-15B	Dissolved	4.00
494092	Water	02-Dec-06	Chromium	16	µg/L		RA-MW-15B	Dissolved	7.00
134243	Water	29-Mar-07	Chromium	9.2	µg/L		RA-MW-15B	Dissolved	2.40
234069	Water	04-Jun-07	Chromium	2.4	µg/L		RA-MW-15B	Dissolved	3.40
384543	Water	17-Sep-07	Chromium	2.8	µg/L		RA-MW-15B	Dissolved	2.60
504155	Water	12-Dec-07	Chromium	4.4	µg/L		RA-MW-15B	Dissolved	4.50
8394094	Water	21-Sep-08	Chromium	2.7	µg/L		RA-MW-15B	Dissolved	1.30
90906515	Water	17-Sep-09	Chromium	1.13	µg/L		RA-MW-15B	Dissolved	0.32
1009065-21	Water	16-Sep-10	Chromium	2.02	µg/L		RA-MW-15B	Dissolved	<10
1009064-17	Water	15-Sep-11	Chromium	2	µg/L	U	RA-MW-15B	Dissolved	0.95
1210057-19	Water	18-Oct-12	Chromium	5.00	µg/L	U	RA-MW-15B	Dissolved	0.31



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

# Well RA-MW-16A

Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2502	Water	14-Oct-03	Chromium	4.9	µg/L	BJ	RA-MW-16A	Total	<10
MJ27E0	Water	10-Nov-03	Chromium	4.7	µg/L	BJ	RA-MW-16A	Total	<10
MJ2AG5	Water	04-Feb-04	Chromium	9.2	µg/L	J	RA-MW-16A	Total	1.00
MJ2BG8	Water	05-Apr-04	Chromium	2	µg/L	J	RA-MW-16A	Total	1.00
MJ4716	Water	16-Aug-04	Chromium	3.5	µg/L	J	RA-MW-16A	Total	2.00
184257	Water	05-May-05	Chromium	2.2	µg/L		RA-MW-16A	Total	8.50
05504293	Water	13-Dec-05	Chromium	4.1	µg/L		RA-MW-16A	Total	1.20
104238	Water	07-Mar-06	Chromium	3.7	µg/L		RA-MW-16A	Total	1.70
244304	Water	12-Jun-06	Chromium	2.8	µg/L		RA-MW-16A	Total	1.00
394189	Water	25-Sep-06	Chromium	1.7	µg/L		RA-MW-16A	Total	1.00
494087	Water	02-Dec-06	Chromium	5	µg/L	U	RA-MW-16A	Total	0.10
134236	Water	29-Mar-07	Chromium	2.9	µg/L		RA-MW-16A	Total	1.70
234085	Water	06-Jun-07	Chromium	2.6	µg/L		RA-MW-16A	Total	1.00
384538	Water	18-Sep-07	Chromium	2.3	µg/L		RA-MW-16A	Total	0.70
8394088	Water	20-Sep-08	Chromium	1	µg/L		RA-MW-16A	Total	1.30
90906509	Water	16-Sep-09	Chromium	0.83	µg/L		RA-MW-16A	Total	0.48
1009065-17	Water	16-Sep-10	Chromium	1.09	µg/L		RA-MW-16A	Total	<10
1009064-19	Water	15-Sep-11	Chromium	2	µg/L	U	RA-MW-16A	Total	1.05
1210057-21	Water	18-Oct-12	Chromium	2.50	µg/L	U	RA-MW-16A	Total	0.63

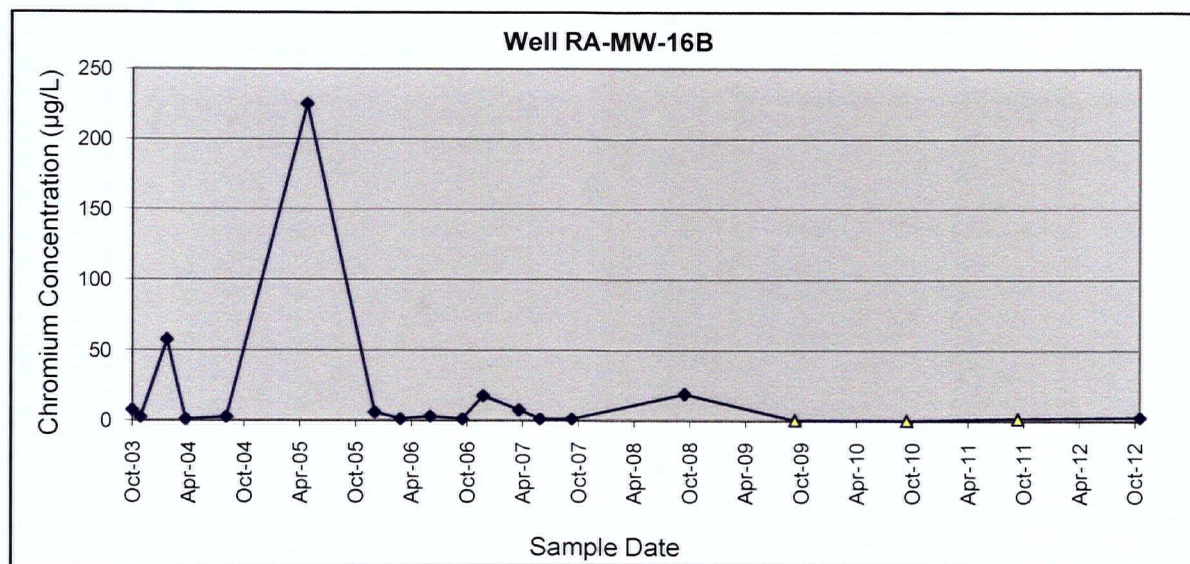


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



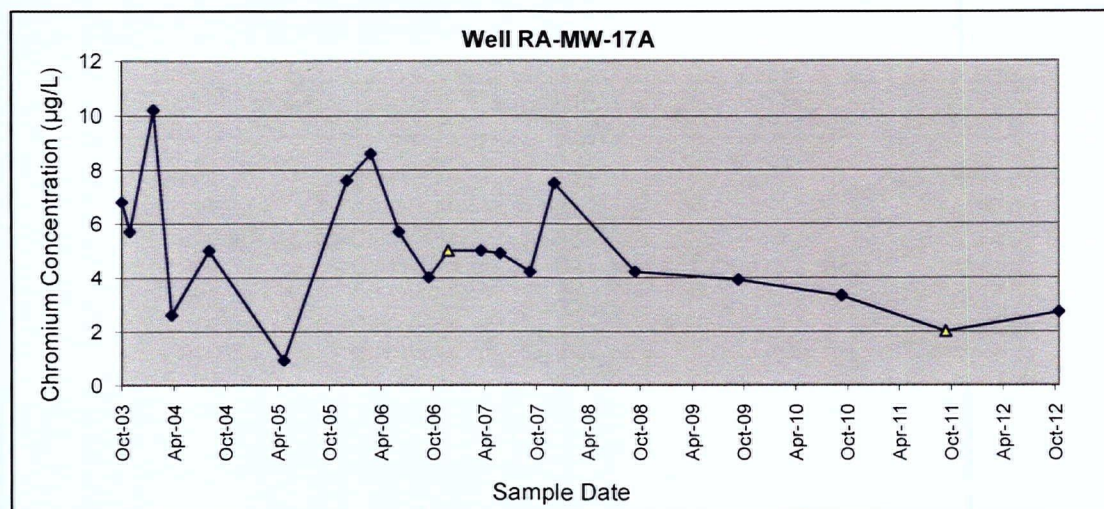
# Well RA-MW-16B

Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2503	Water	14-Oct-03	Chromium	7.6	µg/L	BJ	RA-MW-16B	Total	<10
MJ27E1	Water	10-Nov-03	Chromium	2.5	µg/L	BJ	RA-MW-16B	Total	<10
MJ2AG6	Water	04-Feb-04	Chromium	57.4	µg/L	BJ	RA-MW-16B	Total	1.00
MJ2BH0	Water	05-Apr-04	Chromium	1	µg/L	J	RA-MW-16B	Dissolved	0.00
MJ4717	Water	16-Aug-04	Chromium	2.8	µg/L	J	RA-MW-16B	Total	3.60
184256	Water	05-May-05	Chromium	225	µg/L		RA-MW-16B	Total	5.70
05504291	Water	13-Dec-05	Chromium	6.1	µg/L		RA-MW-16B	Dissolved	3.90
104239	Water	07-Mar-06	Chromium	1.3	µg/L		RA-MW-16B	Total	0.00
244305	Water	12-Jun-06	Chromium	3.2	µg/L		RA-MW-16B	Total	0.30
394187	Water	25-Sep-06	Chromium	1.3	µg/L		RA-MW-16B	Dissolved	0.70
494089	Water	02-Dec-06	Chromium	18	µg/L		RA-MW-16B	Dissolved	0.20
134238	Water	29-Mar-07	Chromium	7.9	µg/L		RA-MW-16B	Dissolved	3.70
234087	Water	06-Jun-07	Chromium	1.4	µg/L		RA-MW-16B	Dissolved	0.30
384540	Water	18-Sep-07	Chromium	1.4	µg/L		RA-MW-16B	Dissolved	3.00
8394089	Water	20-Sep-08	Chromium	19.2	µg/L		RA-MW-16B	Total	0.30
90906510	Water	16-Sep-09	Chromium	0.5	µg/L	U	RA-MW-16B	Total	0.85
1009065-18	Water	16-Sep-10	Chromium	0.5	µg/L	U	RA-MW-16B	Total	<10
1009064-20	Water	15-Sep-11	Chromium	2	µg/L	U	RA-MW-16B	Total	0.85
1210057-22	Water	18-Oct-12	Chromium	3.03	µg/L		RA-MW-16B	Total	0.18



**Well RA-MW-17A**

<u>Sample Number</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Analyte</u>	<u>Conc.</u>	<u>Units</u>	<u>Qualifier</u>	<u>Station Location</u>	<u>Notes</u>	<u>NTU</u>
MJ2501	Water	14-Oct-03	Chromium	6.8	UG/L	BJ	RA-MW-17A	Total	<10
MJ27E5	Water	11-Nov-03	Chromium	5.7	UG/L	BJ	RA-MW-17A	Total	<10
MJ2AG0	Water	03-Feb-04	Chromium	10.2	UG/L	J	RA-MW-17A	Total	1.00
MJ2BH7	Water	06-Apr-04	Chromium	2.6	UG/L	J	RA-MW-17A	Total	0.00
MJ4715	Water	16-Aug-04	Chromium	5	UG/L	J	RA-MW-17A	Total	1.00
184260	Water	05-May-05	Chromium	0.92	UG/L		RA-MW-17A	Total	10.00
05504299	Water	13-Dec-05	Chromium	7.6	UG/L		RA-MW-17A	Total	3.10
104240	Water	07-Mar-06	Chromium	8.6	UG/L		RA-MW-17A	Total	7.00
244293	Water	13-Jun-06	Chromium	5.7	UG/L		RA-MW-17A	Total	1.00
394193	Water	26-Sep-06	Chromium	4.0	UG/L		RA-MW-17A	Total	1.00
494105	Water	04-Dec-06	Chromium	5.0	UG/L	U	RA-MW-17A	Total	0.80
134232	Water	29-Mar-07	Chromium	5.0	UG/L		RA-MW-17A	Total	1.20
234064	Water	04-Jun-07	Chromium	4.9	UG/L		RA-MW-17A	Total	2.70
384532	Water	17-Sep-07	Chromium	4.2	UG/L		RA-MW-17A	Total	1.70
504157	Water	12-Dec-07	Chromium	7.5	UG/L		RA-MW-17A	Total	0.90
8394090	Water	20-Sep-08	Chromium	4.2	UG/L		RA-MW-17A	Total	1.60
90906511	Water	17-Sep-09	Chromium	3.9	UG/L		RA-MW-17A	Total	0.57
1009065-15	Water	15-Sep-10	Chromium	3.31	UG/L		RA-MW-17A	Total	1.10
1009064-21	Water	15-Sep-11	Chromium	2	µg/L	U	RA-MW-17A	Total	1.12
1210057-15	Water	17-Oct-12	Chromium	2.71	µg/L		RA-MW-17A	Total	0.64

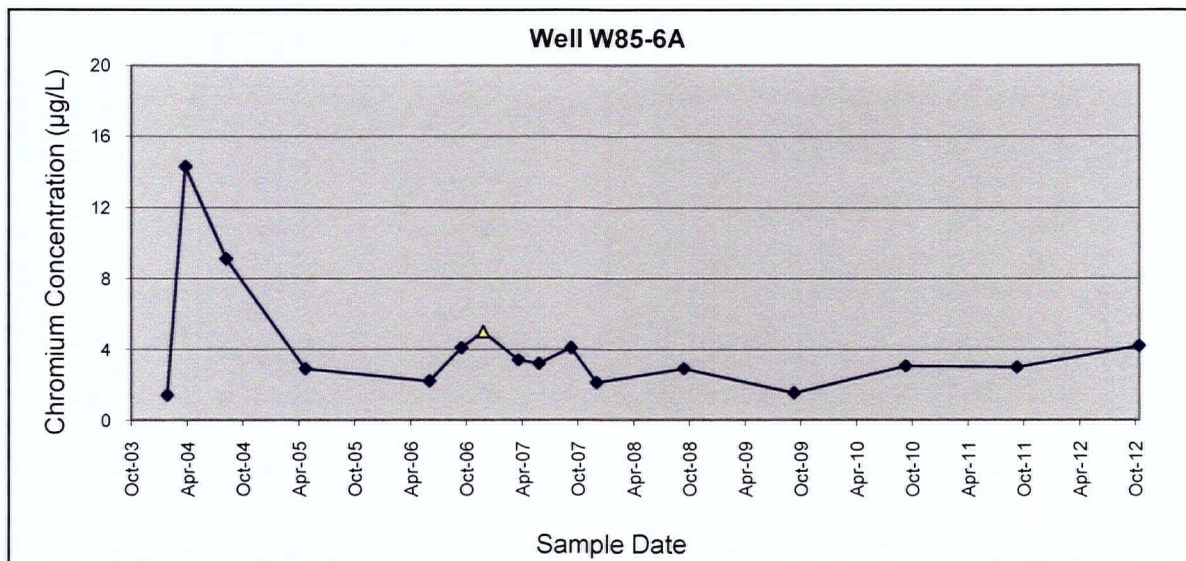


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



# Well W85-6A

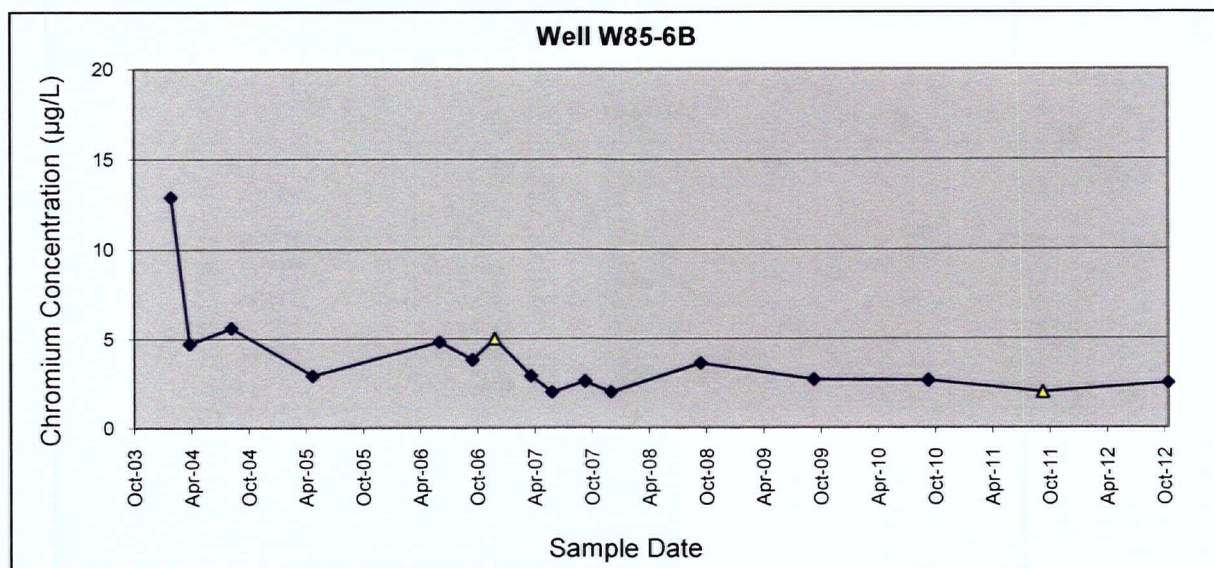
Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ8	Water	09-Feb-04	Chromium	1.4	µg/L	J	W85-6A	Total	No Data
MJ2BL0	Water	08-Apr-04	Chromium	14.3	µg/L		W85-6A	Total	0.00
MJ4747	Water	19-Aug-04	Chromium	9.1	µg/L	J	W85-6A	Total	<10
184235	Water	04-May-05	Chromium	2.9	µg/L		W85-6A	Total	1.00
244284	Water	12-Jun-06	Chromium	2.2	µg/L		W85-6A	Total	0.70
394182	Water	25-Sep-06	Chromium	4.1	µg/L		W85-6A	Total	0.10
494113	Water	05-Dec-06	Chromium	5	µg/L	U	W85-6A	Total	2.00
134245	Water	30-Mar-07	Chromium	3.4	µg/L		W85-6A	Total	0.50
234072	Water	05-Jun-07	Chromium	3.2	µg/L		W85-6A	Total	0.20
384545	Water	18-Sep-07	Chromium	4.1	µg/L		W85-6A	Total	0.60
504132	Water	10-Dec-07	Chromium	2.1	µg/L		W85-6A	Total	0.50
8394083	Water	20-Sep-08	Chromium	2.9	µg/L		W85-6A	Total	0.20
90906501	Water	15-Sep-09	Chromium	1.53	µg/L		W85-6A	Total	0.64
1009065-03	Water	15-Sep-10	Chromium	3.06	µg/L		W85-6A	Total	0.15
1009064-03	Water	13-Sep-11	Chromium	3	µg/L		W85-6A	Total	0.61
1210057-03	Water	16-Oct-12	Chromium	4.21	µg/L		W85-6A	Total	0.14



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

# Well W85-6B

Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ9	Water	09-Feb-04	Chromium	12.9	µg/L		W85-6B	Total	No Data
MJ2BL1	Water	08-Apr-04	Chromium	4.7	µg/L	J	W85-6B	Total	0.00
MJ4748	Water	19-Aug-04	Chromium	5.6	µg/L	J	W85-6B	Total	5.00
184236	Water	04-May-05	Chromium	2.9	µg/L		W85-6B	Total	1.00
244286	Water	12-Jun-06	Chromium	4.8	µg/L		W85-6B	Total	49.00
394183	Water	25-Sep-06	Chromium	3.8	µg/L		W85-6B	Total	14.00
494114	Water	05-Dec-06	Chromium	5	µg/L	U	W85-6B	Total	9.00
134246	Water	30-Mar-07	Chromium	2.9	µg/L		W85-6B	Total	4.60
234073	Water	05-Jun-07	Chromium	2.0	µg/L		W85-6B	Total	1.80
384546	Water	18-Sep-07	Chromium	2.6	µg/L		W85-6B	Total	1.30
504133	Water	10-Dec-07	Chromium	2	µg/L		W85-6B	Total	0.30
8394081	Water	20-Sep-08	Chromium	3.6	µg/L		W85-6B	Total	0.20
90906502	Water	15-Sep-09	Chromium	2.69	µg/L		W85-6B	Total	0.35
1009065-05	Water	14-Sep-10	Chromium	2.65	µg/L		W85-6B	Total	0.30
1009064-05	Water	13-Sep-11	Chromium	2	µg/L	U	W85-6B	Total	0.54
1210057-05	Water	16-Oct-12	Chromium	2.50	µg/L	U	W85-6B	Total	0.24

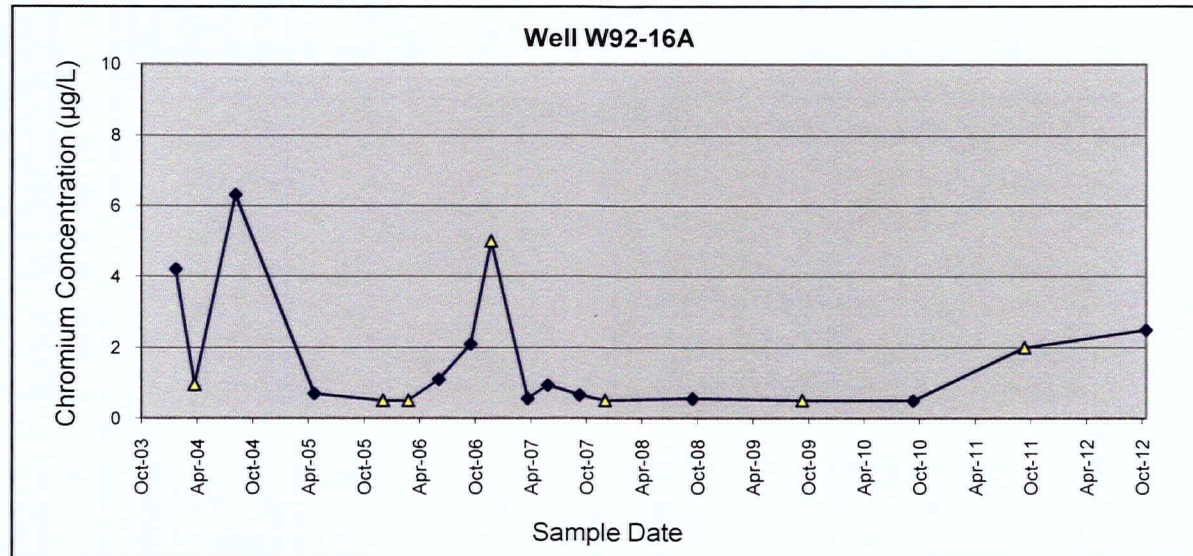


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



# Well W92-16A

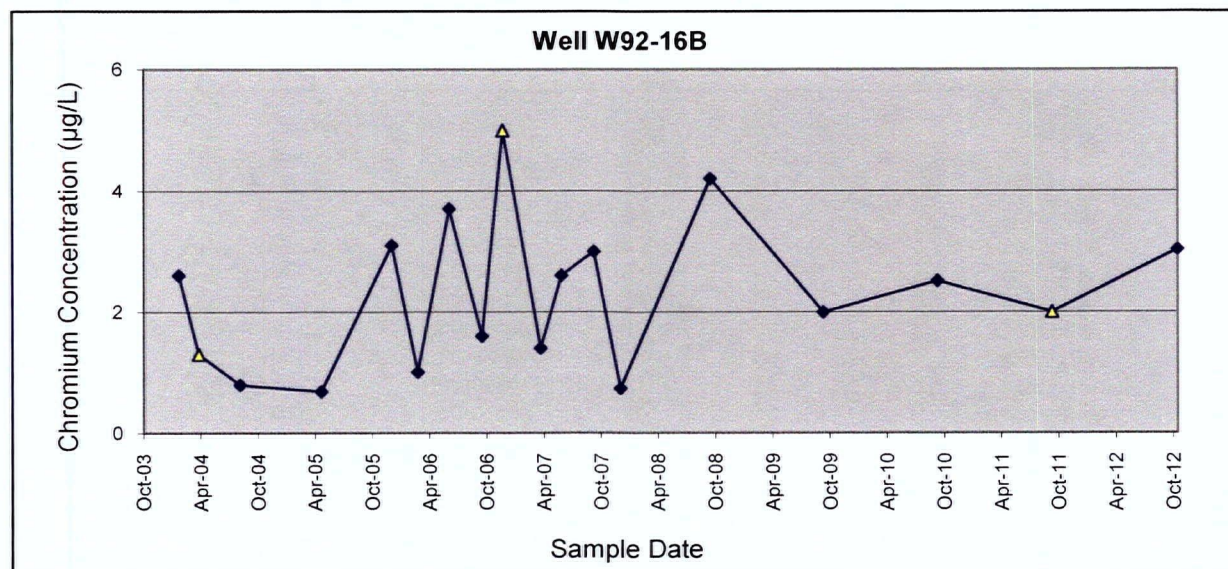
Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH1	Water	05-Feb-04	Chromium	4.2	µg/L	J	W92-16A	Total	2.00
MJ2BJ7	Water	07-Apr-04	Chromium	0.95	µg/L	U	W92-16A	Total	0.00
MJ4734	Water	18-Aug-04	Chromium	6.3	µg/L	J	W92-16A	Total	0.00
184234	Water	03-May-05	Chromium	0.7	µg/L		W92-16A	Total	0.70
05504311	Water	14-Dec-05	Chromium	0.5	µg/L	U	W92-16A	Total	0.70
104234	Water	06-Mar-06	Chromium	0.5	µg/L	U	W92-16A	Total	0.70
244304	Water	14-Jun-06	Chromium	1.1	µg/L		W92-16A	Total	2.00
394200	Water	26-Sep-06	Chromium	2.1	µg/L		W92-16A	Total	4.00
494085	Water	02-Dec-06	Chromium	5	µg/L	U	W92-16A	Total	0.10
134267	Water	01-Apr-07	Chromium	0.56	µg/L		W92-16A	Total	2.50
234093	Water	06-Jun-07	Chromium	0.94	µg/L		W92-16A	Total	1.80
384549	Water	18-Sep-07	Chromium	0.66	µg/L		W92-16A	Total	1.30
504152	Water	11-Dec-07	Chromium	0.5	µg/L	U	W92-16A	Total	0.40
8394091	Water	22-Sep-08	Chromium	0.55	µg/L		W92-16A	Total	1.50
90906521	Water	16-Sep-09	Chromium	0.5	µg/L	U	W92-16A	Total	0.48
1009065-12	Water	15-Sep-10	Chromium	0.5	µg/L	U	W92-16A	Total	0.50
1009064-12	Water	14-Sep-11	Chromium	2	µg/L	U	W92-16A	Total	0.47
1210057-16	Water	17-Oct-12	Chromium	2.50	µg/L		W92-16A	Total	1.33



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

# Well W92-16B

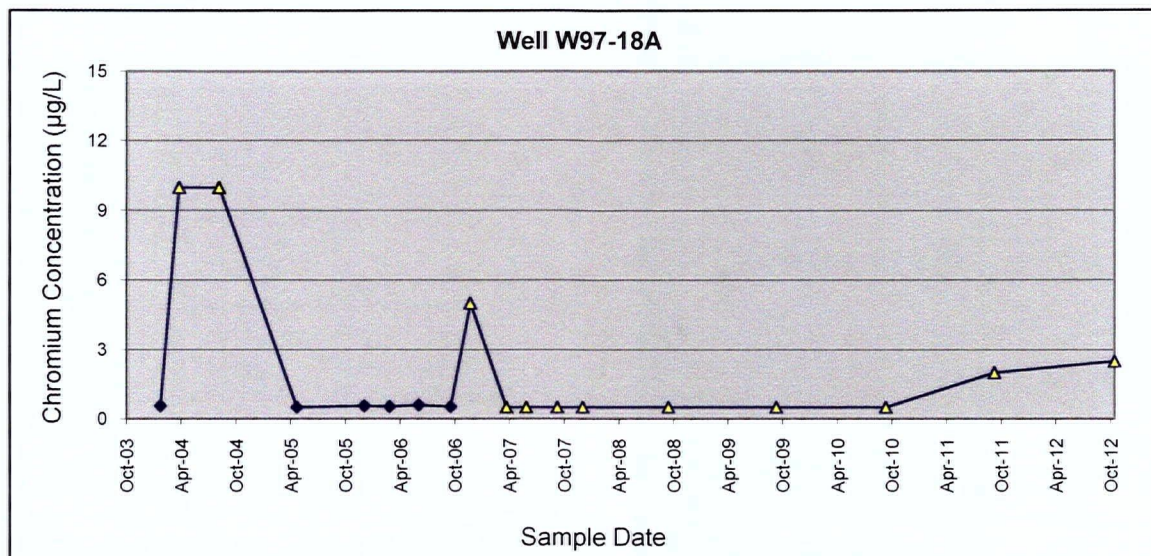
Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH3	Water	05-Feb-04	Chromium	2.6	µg/L	J	W92-16B	Total	7.00
MJ2BJ8	Water	07-Apr-04	Chromium	1.3	µg/L	U	W92-16B	Total	2.00
MJ4735	Water	18-Aug-04	Chromium	0.79	µg/L	J	W92-16B	Total	<10
184233	Water	03-May-05	Chromium	0.68	µg/L		W92-16B	Total	3.90
05504312	Water	14-Dec-05	Chromium	3.1	µg/L		W92-16B	Total	5.10
104233	Water	06-Mar-06	Chromium	1	µg/L		W92-16B	Total	8.70
244305	Water	14-Jun-06	Chromium	3.7	µg/L		W92-16B	Total	7.00
394201	Water	26-Sep-06	Chromium	1.6	µg/L		W92-16B	Total	0.70
494086	Water	02-Dec-06	Chromium	5	µg/L	U	W92-16B	Total	1.00
134268	Water	01-Apr-07	Chromium	1.4	µg/L		W92-16B	Total	6.80
234094	Water	06-Jun-07	Chromium	2.6	µg/L		W92-16B	Total	0.60
384550	Water	18-Sep-07	Chromium	3.0	µg/L		W92-16B	Total	2.20
504151	Water	11-Dec-07	Chromium	0.73	µg/L		W92-16B	Total	2.20
8394092	Water	22-Sep-08	Chromium	4.2	µg/L		W92-16B	Total	3.80
90906522	Water	16-Sep-09	Chromium	1.99	µg/L		W92-16B	Total	0.85
1009065-11	Water	15-Sep-10	Chromium	2.51	µg/L		W92-16B	Total	0.55
1009064-13	Water	14-Sep-11	Chromium	2	µg/L	U	W92-16B	Total	1.90
1210057-17	Water	17-Oct-12	Chromium	3.03	µg/L		W92-16B	Total	0.52





# Well W97-18A

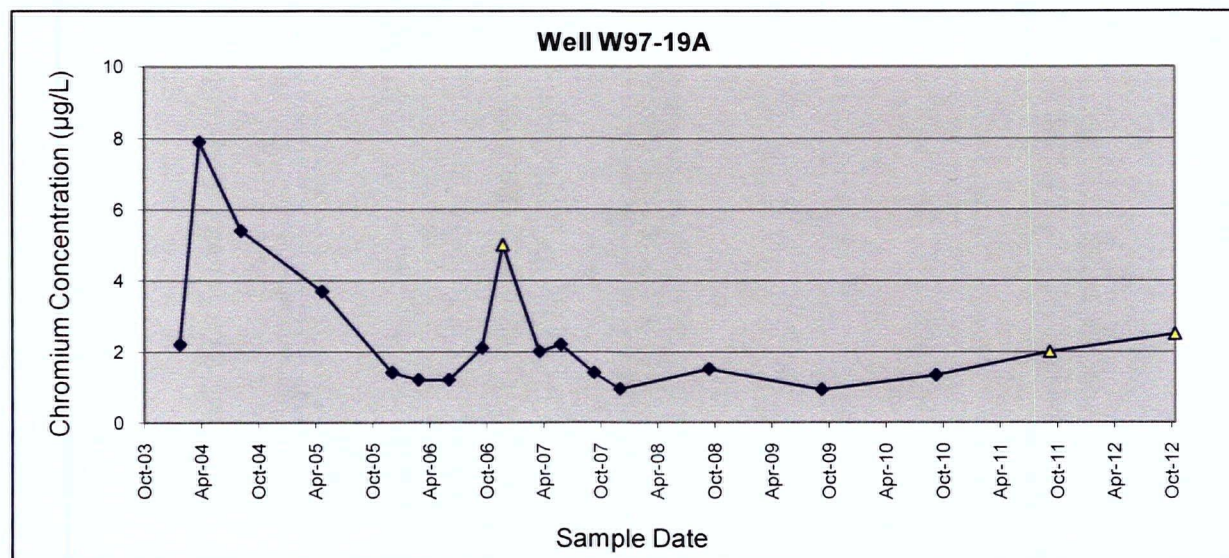
Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AH5	Water	05-Feb-04	Chromium	0.56	µg/L	J	W97-18A	Total	14.00
MJ2BK2	Water	07-Apr-04	Chromium	10	µg/L	U	W97-18A	Total	0.00
MJ4739	Water	18-Aug-04	Chromium	10	µg/L	U	W97-18A	Total	5.00
184244	Water	04-May-05	Chromium	0.5	µg/L		W97-18A	Total	1.00
05504300	Water	14-Dec-05	Chromium	0.56	µg/L		W97-18A	Total	4.00
104256	Water	08-Mar-06	Chromium	0.53	µg/L		W97-18A	Total	0.00
244298	Water	13-Jun-06	Chromium	0.6	µg/L		W97-18A	Total	9.00
394209	Water	27-Sep-06	Chromium	0.53	µg/L		W97-18A	Total	6.00
494080	Water	02-Dec-06	Chromium	5	µg/L	U	W97-18A	Total	1.00
134269	Water	01-Apr-07	Chromium	0.5	µg/L	U	W97-18A	Total	8.50
234095	Water	06-Jun-07	Chromium	0.5	µg/L	U	W97-18A	Total	0.60
384555	Water	18-Sep-07	Chromium	0.5	µg/L	U	W97-18A	Total	7.70
504142	Water	11-Dec-07	Chromium	0.5	µg/L	U	W97-18A	Total	3.10
8394097	Water	21-Sep-08	Chromium	0.5	µg/L	U	W97-18A	Total	0.90
90906512	Water	16-Sep-09	Chromium	0.5	µg/L	U	W97-18A	Total	0.35
1009065-16	Water	16-Sep-10	Chromium	0.5	µg/L	U	W97-18A	Total	<10
1009064-09	Water	13-Sep-11	Chromium	2	µg/L	U	W97-18A	Total	0.88
1210057-14	Water	17-Oct-12	Chromium	2.50	µg/L	U	W97-18A	Total	0.37



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

# Well W97-19A

Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ0	Water	06-Feb-04	Chromium	2.2	µg/L	J	W97-19A	Total	7.00
MJ2BK4	Water	08-Apr-04	Chromium	7.9	µg/L	J	W97-19A	Total	2.00
MJ4749	Water	19-Aug-04	Chromium	5.4	µg/L	J	W97-19A	Total	8.00
184242	Water	04-May-05	Chromium	3.7	µg/L		W97-19A	Total	1.80
05504303	Water	14-Dec-05	Chromium	1.4	µg/L		W97-19A	Total	0.00
104259	Water	08-Mar-06	Chromium	1.2	µg/L		W97-19A	Total	1.00
244296	Water	13-Jun-06	Chromium	1.2	µg/L		W97-19A	Total	1.00
394211	Water	27-Sep-06	Chromium	2.1	µg/L		W97-19A	Total	0.40
494095	Water	03-Dec-06	Chromium	5.0	µg/L	U	W97-19A	Total	1.00
134239	Water	29-Mar-07	Chromium	2.0	µg/L		W97-19A	Total	3.30
234077	Water	05-Jun-07	Chromium	2.2	µg/L		W97-19A	Total	1.80
384556	Water	19-Sep-07	Chromium	1.4	µg/L		W97-19A	Total	1.90
504149	Water	11-Dec-07	Chromium	0.94	µg/L		W97-19A	Total	1.00
8394084	Water	20-Sep-08	Chromium	1.5	µg/L		W97-19A	Total	1.90
90906505	Water	14-Sep-09	Chromium	0.92	µg/L		W97-19A	Total	3.23
1009065-01	Water	14-Sep-10	Chromium	1.33	µg/L		W97-19A	Total	3.00
1009064-01	Water	12-Sep-11	Chromium	2	µg/L	U	W97-19A	Total	0.70
1210057-01	Water	15-Oct-12	Chromium	2.50	µg/L	U	W97-19A	Total	0.27

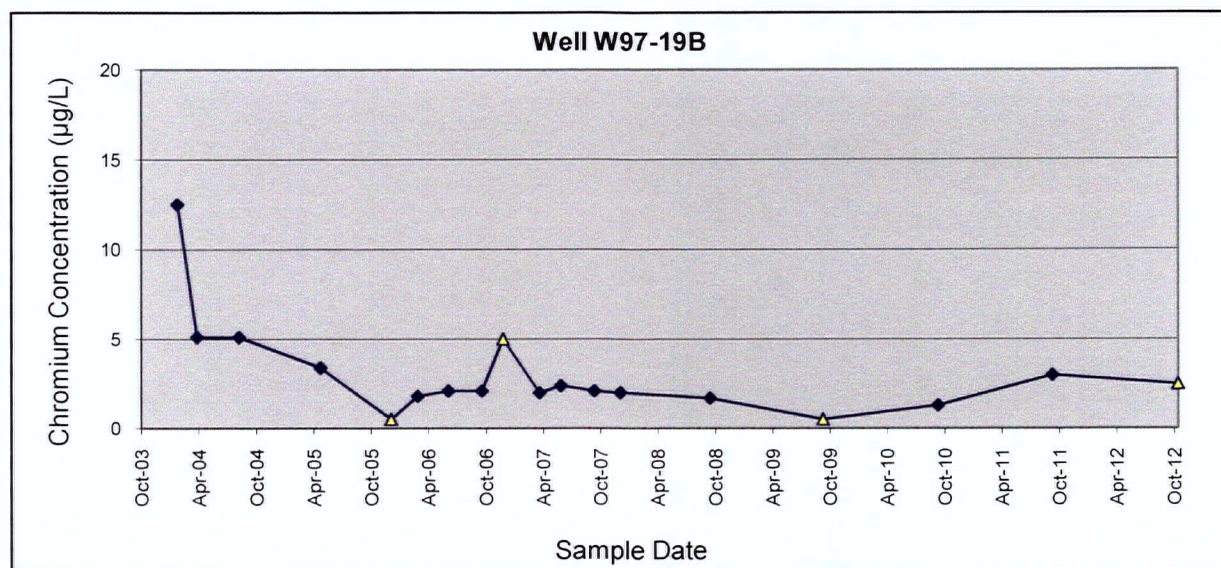


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



# Well W97-19B

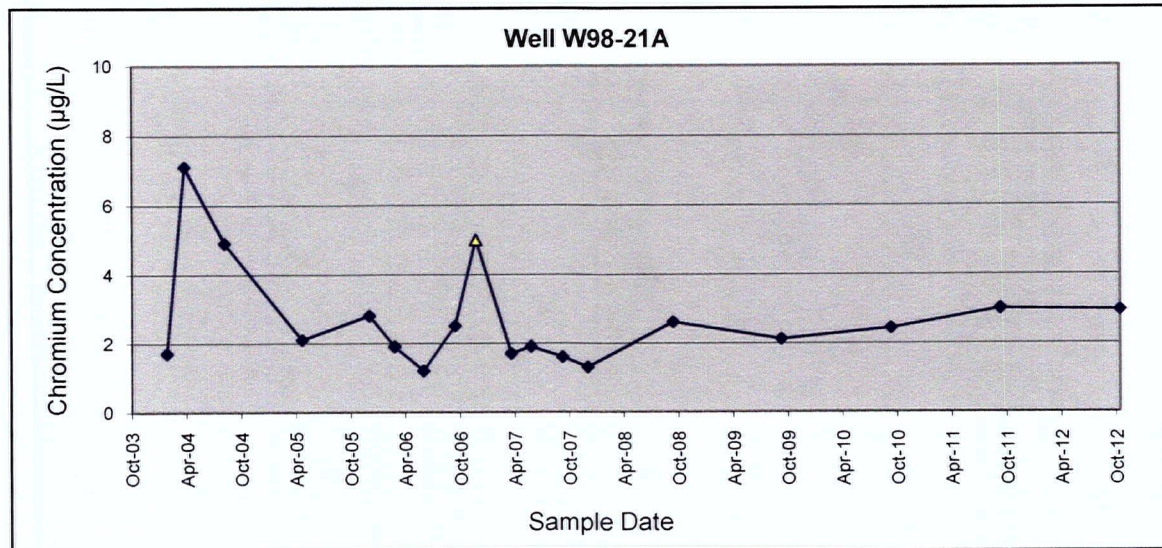
Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ1	Water	06-Feb-04	Chromium	12.5	µg/L	J	W97-19B	Total	0.00
MJ2BK5	Water	08-Apr-04	Chromium	5.1	µg/L	J	W97-19B	Total	1.00
MJ4750	Water	19-Aug-04	Chromium	5.1	µg/L	J	W97-19B	Total	3.00
184243	Water	04-May-05	Chromium	3.4	µg/L		W97-19B	Total	1.00
05504304	Water	14-Dec-05	Chromium	0.5	µg/L	U	W97-19B	Total	0.00
104260	Water	08-Mar-06	Chromium	1.8	µg/L		W97-19B	Total	5.00
244297	Water	13-Jun-06	Chromium	2.1	µg/L		W97-19B	Total	0.50
394212	Water	27-Sep-06	Chromium	2.1	µg/L		W97-19B	Total	1.00
494096	Water	03-Dec-06	Chromium	5.0	µg/L	U	W97-19B	Total	1.00
134240	Water	29-Mar-07	Chromium	2.0	µg/L		W97-19B	Total	6.90
234078	Water	05-Jun-07	Chromium	2.4	µg/L		W97-19B	Total	1.90
384557	Water	19-Sep-07	Chromium	2.1	µg/L		W97-19B	Total	0.20
504150	Water	11-Dec-07	Chromium	2.0	µg/L		W97-19B	Total	4.70
8394085	Water	20-Sep-08	Chromium	1.7	µg/L		W97-19B	Total	0.20
90906506	Water	14-Sep-09	Chromium	0.5	µg/L	U	W97-19B	Total	0.50
1009065-02	Water	14-Sep-10	Chromium	1.3	µg/L		W97-19B	Total	0.20
1009064-02	Water	12-Sep-11	Chromium	3	µg/L		W97-19B	Total	0.54
1210057-02	Water	15-Oct-12	Chromium	2.50	µg/L	U	W97-19B	Total	0.37



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

**Well W98-21A**

<u>Sample Number</u>	<u>Matrix</u>	<u>Sample Date</u>	<u>Analyte</u>	<u>Conc.</u>	<u>Units</u>	<u>Qualifier</u>	<u>Station Location</u>	<u>Notes</u>	<u>NTU</u>
MJ2AJ6	Water	09-Feb-04	Chromium	1.7	µg/L	J	W98-21A	Total	No Data
MJ2BK8	Water	08-Apr-04	Chromium	7.1	µg/L	J	W98-21A	Total	0.00
MJ4743	Water	19-Aug-04	Chromium	4.9	µg/L	J	W98-21A	Total	0.00
184237	Water	04-May-05	Chromium	2.1	µg/L		W98-21A	Total	1.30
05504309	Water	14-Dec-05	Chromium	2.8	µg/L		W98-21A	Total	0.10
104261	Water	08-Mar-06	Chromium	1.9	µg/L		W98-21A	Total	0.00
244282	Water	12-Jun-06	Chromium	1.2	µg/L		W98-21A	Total	0.30
394185	Water	25-Sep-06	Chromium	2.5	µg/L		W98-21A	Total	0.20
494098	Water	03-Dec-06	Chromium	5	µg/L	U	W98-21A	Total	0.10
134261	Water	31-Mar-07	Chromium	1.7	µg/L		W98-21A	Total	0.20
234074	Water	05-Jun-07	Chromium	1.9	µg/L		W98-21A	Total	0.90
384547	Water	18-Sep-07	Chromium	1.6	µg/L		W98-21A	Total	0.20
504146	Water	11-Dec-07	Chromium	1.3	µg/L		W98-21A	Total	2.60
8394082	Water	20-Sep-08	Chromium	2.6	µg/L		W98-21A	Total	0.10
90906503	Water	15-Sep-09	Chromium	2.11	µg/L		W98-21A	Total	0.72
1009065-13	Water	15-Sep-10	Chromium	2.43	µg/L		W98-21A	Total	0.15
1009064-14	Water	14-Sep-11	Chromium	3	µg/L		W98-21A	Total	0.59
1210057-09	Water	16-Oct-12	Chromium	2.95	µg/L		W98-21A	Total	0.23

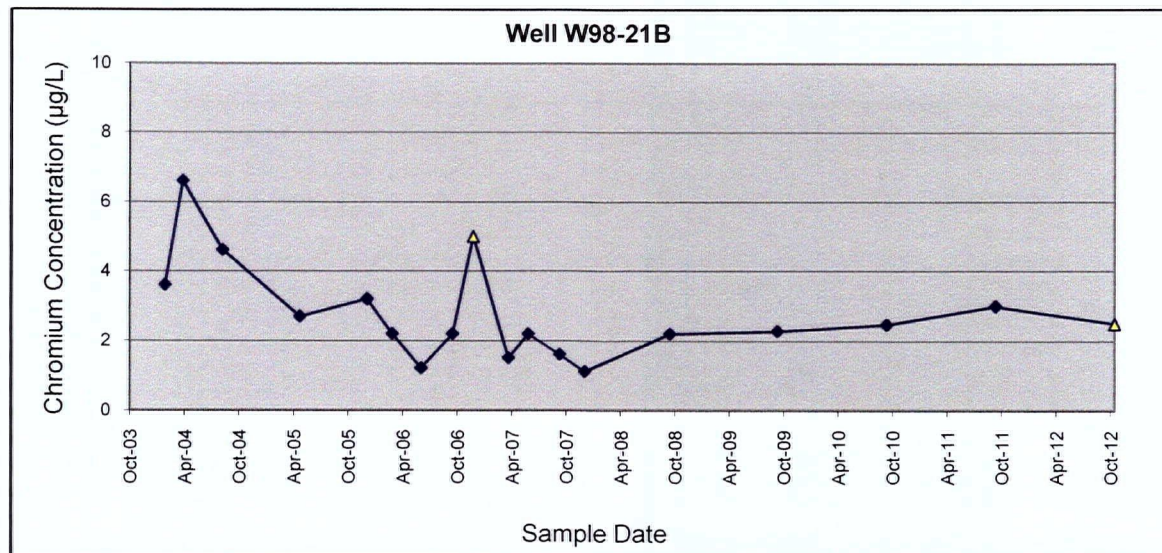


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



# Well W98-21B

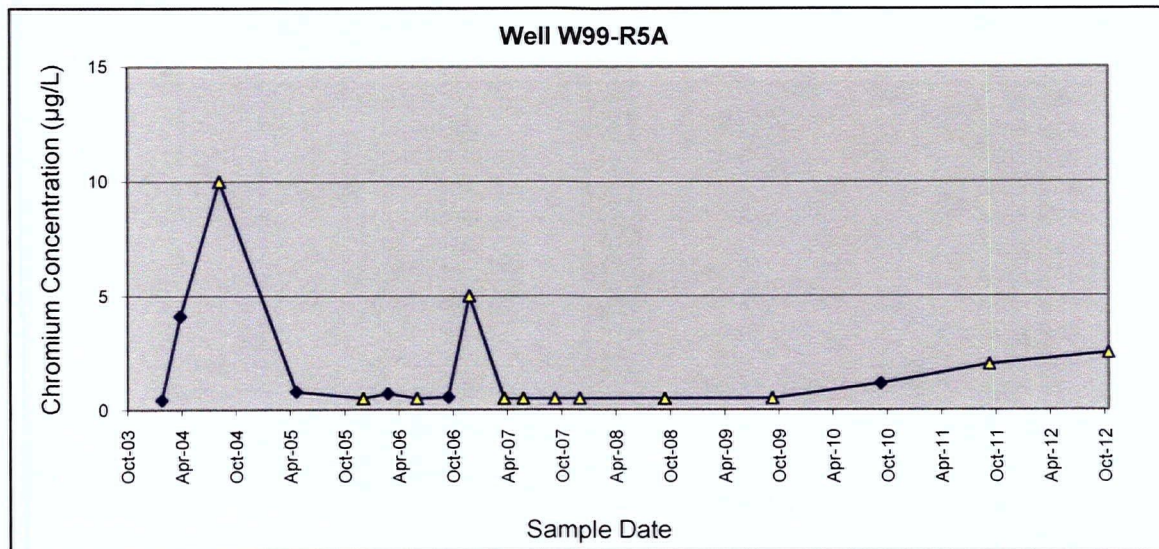
Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ7	Water	09-Feb-04	Chromium	3.6	µg/L	J	W98-21B	Total	No Data
MJ2BK9	Water	08-Apr-04	Chromium	6.6	µg/L	J	W98-21B	Total	0.00
MJ4744	Water	19-Aug-04	Chromium	4.6	µg/L	J	W98-21B	Total	5.00
184238	Water	04-May-05	Chromium	2.7	µg/L		W98-21B	Total	0.50
05504310	Water	14-Dec-05	Chromium	3.2	µg/L		W98-21B	Total	0.00
104262	Water	08-Mar-06	Chromium	2.2	µg/L		W98-21B	Total	0.00
244283	Water	12-Jun-06	Chromium	1.2	µg/L		W98-21B	Total	0.30
394186	Water	25-Sep-06	Chromium	2.2	µg/L		W98-21B	Total	0.10
494099	Water	03-Dec-06	Chromium	5	µg/L	U	W98-21B	Total	0.20
134262	Water	31-Mar-07	Chromium	1.5	µg/L		W98-21B	Total	0.10
234075	Water	05-Jun-07	Chromium	2.2	µg/L		W98-21B	Total	0.20
384548	Water	18-Sep-07	Chromium	1.6	µg/L		W98-21B	Total	0.20
504147	Water	11-Dec-07	Chromium	1.1	µg/L		W98-21B	Total	1.70
8394083	Water	20-Sep-08	Chromium	2.2	µg/L		W98-21B	Total	0.40
90906504	Water	15-Sep-09	Chromium	2.28	µg/L		W98-21B	Total	0.76
1009065-14	Water	15-Sep-10	Chromium	2.47	µg/L		W98-21B	Total	0.45
1009064-15	Water	14-Sep-11	Chromium	3	µg/L		W98-21B	Total	0.61
1210057-08	Water	16-Oct-12	Chromium	2.50	µg/L	U	W98-21B	Total	0.16



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.

# Well W99-R5A

Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ3	Water	07-Feb-04	Chromium	0.41	µg/L	J	W99-R5A	Total	0.00
MJ2BL3	Water	09-Apr-04	Chromium	4.1	µg/L	J	W99-R5A	Total	0.00
MJ4745	Water	19-Aug-04	Chromium	10	µg/L	U	W99-R5A	Total	10.00
184230	Water	03-May-05	Chromium	0.79	µg/L		W99-R5A	Total	1.00
05504305	Water	14-Dec-05	Chromium	0.5	µg/L	U	W99-R5A	Total	0.00
104230	Water	06-Mar-06	Chromium	0.7	µg/L		W99-R5A	Total	0.00
244280	Water	12-Jun-06	Chromium	0.5	µg/L	U	W99-R5A	Total	1.00
394180	Water	25-Sep-06	Chromium	0.55	µg/L		W99-R5A	Total	1.00
494115	Water	05-Dec-06	Chromium	5	µg/L	U	W99-R5A	Total	1.00
134264	Water	31-Mar-07	Chromium	0.5	µg/L	U	W99-R5A	Total	0.30
234060	Water	04-Jun-07	Chromium	0.5	µg/L	U	W99-R5A	Total	0.40
384530	Water	17-Sep-07	Chromium	0.5	µg/L	U	W99-R5A	Total	1.00
504130	Water	10-Dec-07	Chromium	0.5	µg/L	U	W99-R5A	Total	0.50
8394086	Water	20-Sep-08	Chromium	0.5	µg/L	U	W99-R5A	Total	0.40
90906507	Water	15-Sep-09	Chromium	0.5	µg/L	U	W99-R5A	Total	0.22
1009065-07	Water	14-Sep-10	Chromium	1.14	µg/L		W99-R5A	Total	0.10
1009064-07	Water	13-Sep-11	Chromium	2	µg/L	U	W99-R5A	Total	0.54
1210057-06	Water	16-Oct-12	Chromium	2.50	µg/L	U	W99-R5A	Total	0.23

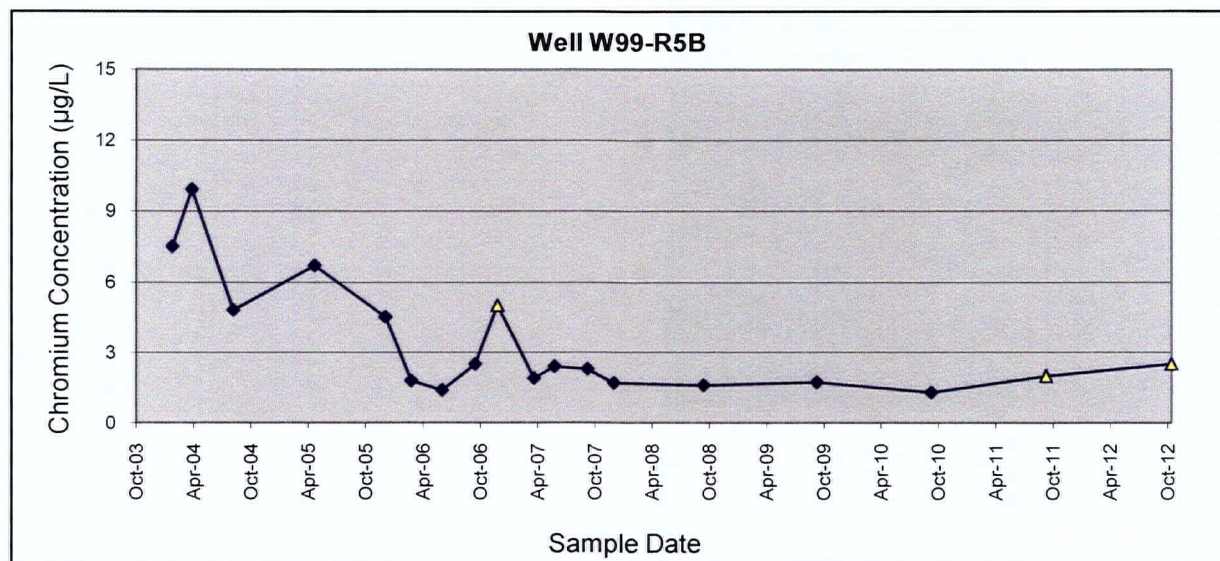


Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



# Well W99-R5B

Sample Number	Matrix	Sample Date	Analyte	Conc.	Units	Qualifier	Station Location	Notes	NTU
MJ2AJ5	Water	07-Feb-04	Chromium	7.5	µg/L	J	W99-R5B	Total	0.00
MJ2BL4	Water	09-Apr-04	Chromium	9.9	µg/L	J	W99-R5B	Total	0.00
MJ4746	Water	19-Aug-04	Chromium	4.8	µg/L	J	W99-R5B	Total	8.00
184231	Water	03-May-05	Chromium	6.7	µg/L		W99-R5B	Total	2.30
05504306	Water	14-Dec-05	Chromium	4.5	µg/L		W99-R5B	Total	2.10
104231	Water	06-Mar-06	Chromium	1.8	µg/L		W99-R5B	Total	0.00
244281	Water	12-Jun-06	Chromium	1.4	µg/L		W99-R5B	Total	3.00
394181	Water	25-Sep-06	Chromium	2.5	µg/L		W99-R5B	Total	1.00
494116	Water	05-Dec-06	Chromium	5	µg/L	U	W99-R5B	Total	1.00
134265	Water	31-Mar-07	Chromium	1.9	µg/L		W99-R5B	Total	10.00
234061	Water	04-Jun-07	Chromium	2.4	µg/L		W99-R5B	Total	0.70
384531	Water	17-Sep-07	Chromium	2.3	µg/L		W99-R5B	Total	1.60
504130	Water	10-Dec-07	Chromium	1.7	µg/L		W99-R5B	Total	2.00
8394087	Water	20-Sep-08	Chromium	1.6	µg/L		W99-R5B	Total	0.80
90906508	Water	15-Sep-09	Chromium	1.73	µg/L		W99-R5B	Total	0.24
1009065-06	Water	14-Sep-10	Chromium	1.3	µg/L		W99-R5B	Total	0.20
1009064-06	Water	13-Sep-11	Chromium	2	µg/L	U	W99-R5B	Total	0.90
1210057-07	Water	16-Oct-12	Chromium	2.50	µg/L	U	W99-R5B	Total	0.19



Note: Where a dissolved concentration is used, the NTU value listed is the pre-filtering value.



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**APPENDIX B**  
**LABORATORY DATA SHEETS**

**Manchester Environmental Laboratory**  
7411 Beach Drive E, Port Orchard, Washington 98366

**Case Narrative**

October 29, 2012

Project: Metals Frontier Hardchrome-2012

Work Order: 1210057

Project  
Manager: Barrett, Guy

By: Dean Momohara

**Summary**

The laboratory followed EPA 200.7 for the preparation and analysis of trace metals.

All analyses requested were evaluated by established regulatory quality assurance guidelines.

**Sample Information**

The samples were received at the Manchester Laboratory on 10/23/2012. The samples were received in good condition and were properly preserved. Twenty five samples were received and assigned laboratory identification numbers 01 to 03 and 05 to 26.

**Holding Times**

The laboratory performed all analyses within their hold times.

**Calibration**

The instruments were calibrated following the appropriate methods. All initial and continuing calibration verification checks were within the acceptance limits. All initial and continuing calibration verification and blank checks were within the acceptance limits. The instruments were calibrated with NIST traceable standards and verified to be in calibration with a second source NIST traceable standard.



### **Method Blanks**

No analytically significant levels of analyte were detected in the method blanks associated with these samples.

### **Laboratory Control Samples**

All laboratory control sample recoveries were within the acceptance limits.

### **Replicates**

All associated duplicate relative percent differences of samples with concentrations greater than 5 times the reporting limit were within the acceptance limits.

### **Matrix Spikes**

All matrix spike recoveries were within the acceptance limits.

### **Internal Standards**

NA

### **Other Quality Assurance Measures and Issues**

U - The analyte was not detected at or above the reported result.

**bold** - The analyte was present in the sample. (Visual Aid to locate detected compounds on report sheet.)

Please call Dean Momohara at (360) 871-8808 to further discuss this project.

cc: Project File

**Washington State Department of Ecology**  
**Manchester Environmental Laboratory**  
**Final Analysis Report for**  
**Chromium, total\_ICP**

**Project Name: Frontier Hardchrome-2012**

**Work Order: 1210057**  
**Project Officer: Barrett, Guy**  
**Date Collected: 10/15/2012**

**Analyte: Chromium**  
**Method: EPA200.7**  
**Date Analyzed: 10/26/2012**

**Matrix: Water**  
**Units: ug/L**

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
1210057-01	W97-19A	2.50	U	2.50	0.717	10/15/12	10/26/12	B12J210
1210057-02	W97-19B	2.50	U	2.50	0.717	10/15/12	10/26/12	B12J210
<b>1210057-03</b>	<b>W85-6A</b>	<b>4.21</b>		2.50	0.717	10/16/12	10/26/12	B12J210
<b>1210057-05</b>	<b>W85-6B</b>	<b>2.50</b>		2.50	0.717	10/16/12	10/26/12	B12J210
1210057-06	W99-R5A	2.50	U	2.50	0.717	10/16/12	10/26/12	B12J210
1210057-07	W99-R5B	2.50	U	2.50	0.717	10/16/12	10/26/12	B12J210
1210057-08	W98-21B	2.50	U	2.50	0.717	10/16/12	10/26/12	B12J210
<b>1210057-09</b>	<b>W98-21A</b>	<b>2.95</b>		2.50	0.717	10/16/12	10/26/12	B12J210
1210057-10	B85-3	2.50	U	2.50	0.717	10/16/12	10/26/12	B12J210
1210057-11	B85-4	2.50	U	2.50	0.717	10/17/12	10/26/12	B12J210
1210057-12	QA-2	2.50	U	2.50	0.717	10/17/12	10/26/12	B12J210
<b>1210057-13</b>	<b>B87-8</b>	<b>6.86</b>		2.50	0.717	10/17/12	10/26/12	B12J210
1210057-14	W97-18A	2.50	U	2.50	0.717	10/17/12	10/26/12	B12J210
<b>1210057-15</b>	<b>RA-MW-17A</b>	<b>2.71</b>		2.50	0.717	10/17/12	10/26/12	B12J210

**QC Results for Batch ID: B12J210**

Method Blank	Sample ID	Result	Qualifier	RL	MDL	Analyzed			
B12J210-BLK1	Blank	2.50	U	2.50	0.717	10/26/12			

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B12J210-BS1	LCS	1960	2000			98	85-115		
B12J210-MS1	Matrix Spike	1960	2000	1210057-01	1.27	98	75-125		
B12J210-MSD1	Matrix Spike Dup	1980	2000	1210057-01	1.27	99	75-125	1	20

Authorized by: DM

Release Date: 10/29/12

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10/29/2012

**Washington State Department of Ecology  
Manchester Environmental Laboratory  
Final Analysis Report for  
Chromium, total\_ICP**

**Project Name: Frontier Hardchrome-2012**

**Work Order: 1210057  
Project Officer: Barrett, Guy  
Date Collected: 10/17/2012**

**Analyte: Chromium  
Method: EPA200.7  
Date Analyzed: 10/26/2012**

**Matrix: Water  
Units: ug/L**

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
1210057-16	W92-16A	2.50	U	2.50	0.717	10/17/12	10/26/12	B12J261
1210057-17	W92-16B	3.03		2.50	0.717	10/17/12	10/26/12	B12J261
1210057-18	RA-MW-15A	9.00		2.50	0.717	10/18/12	10/26/12	B12J261
1210057-19	RA-MW-15B	2.50	U	2.50	0.717	10/18/12	10/26/12	B12J261
1210057-20	QA-3	2.50	U	2.50	0.717	10/18/12	10/26/12	B12J261
1210057-21	RA-MW-16A	2.50	U	2.50	0.717	10/18/12	10/26/12	B12J261
1210057-22	RA-MW-16B	2.50	U	2.50	0.717	10/18/12	10/26/12	B12J261
1210057-23	RA-MW-12C	2.50	U	2.50	0.717	10/18/12	10/26/12	B12J261
1210057-24	RA-MW-12B	2.50	U	2.50	0.717	10/18/12	10/26/12	B12J261
1210057-25	RA-MW-12A	61.9		2.50	0.717	10/18/12	10/26/12	B12J261
1210057-26	QA-4	73.3		2.50	0.717	10/18/12	10/26/12	B12J261

**QC Results for Batch ID: B12J261**

Method Blank	Sample ID	Result	Qualifier	RL	MDL	Analyzed
B12J261-BLK1	Blank	2.50	U	2.50	0.717	10/26/12

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B12J261-BS1	LCS	2000	2000			100	85-115		
B12J261-MS1	Matrix Spike	1920	2000	1210057-16	1.40	96	75-125		
B12J261-MSD1	Matrix Spike Dup	1900	2000	1210057-16	1.40	95	75-125	0.7	20

Authorized by: Dr

Release Date: 10/29/12

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10/29/2012



**Washington State Department of Ecology  
Manchester Environmental Laboratory  
Final Analysis Report for  
Dissolved Chromium**

**Project Name: Frontier Hardchrome-2012**

**Work Order: 1210057  
Project Officer: Barrett, Guy  
Date Collected: 10/17/2012**

**Analyte: Chromium  
Method: EPA200.7  
Date Analyzed: 10/23/2012**

**Matrix: Water  
Units: ug/L**

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
1210057-13	B87-8	5.00	U	5.00	2.00	10/17/12	10/23/12	B12J193
1210057-19	RA-MW-15B	5.00	U	5.00	2.00	10/18/12	10/23/12	B12J193
1210057-20	QA-3	5.00	U	5.00	2.00	10/18/12	10/23/12	B12J193
1210057-25	RA-MW-12A	6.08		5.00	2.00	10/18/12	10/23/12	B12J193

**QC Results for Batch ID: B12J193**

Method Blank	Sample ID	Result	Qualifier	RL	MDL	Analyzed			
B12J193-BLK1	Blank	5.00	U	5.00	2.00	10/23/12			

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B12J193-BS1	LCS	3750	4000			94	85-115		
B12J193-MS1	Matrix Spike	4490	5000	1210057-13	2.10	90	75-125		
B12J193-MSD1	Matrix Spike Dup	4580	5000	1210057-13	2.10	92	75-125	2	20

Authorized by: DM

Release Date: 10/29/12

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10/29/2012



October 19, 2012

Analytical Report for Service Request No: K1210496

Karin Feddersen  
Washington State Department of Ecology  
7411 Beach Drive East  
Port Orchard, WA 98366

**RE: FRONTIER HARDCHROME/1210057**

Dear Karin:


Enclosed are the results of the sample submitted to our laboratory on October 17, 2012. For your reference, these analyses have been assigned our service request number K1210496.

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at [www.caslab.com](http://www.caslab.com). All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. dba ALS Environmental (ALS) is not responsible for use of less than the complete report. Results apply only to the items submitted to the laboratory for analysis and individual items (samples) analyzed, as listed in the report.

Please call if you have any questions. My extension is 3364. You may also contact me via Email at [Howard.Holmes@alsglobal.com](mailto:Howard.Holmes@alsglobal.com).

Respectfully submitted,

**Columbia Analytical Services, Inc. dba ALS Environmental**

  
Howard Holmes  
Project Manager

HH/jw

Page 1 of 21



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Columbia Analytical Services, Inc.

Part of the ALS Group A Campbell Brothers Limited Company



[www.caslab.com](http://www.caslab.com) ■ [www.alsglobal.com](http://www.alsglobal.com)

RIGHT SOLUTIONS RIGHT PARTNER

## Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LOD	Limit of Detection
LOQ	Limit of Quantitation
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.



### Inorganic Data Qualifiers

- \* The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- E The result is an estimate amount because the value exceeded the instrument calibration range.
- J The result is an estimated value.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.  
*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.
- H The holding time for this test is immediately following sample collection. The samples were analyzed as soon as possible after receipt by the laboratory.

### Metals Data Qualifiers

- # The control limit criteria is not applicable. See case narrative.
- J The result is an estimated value.
- E The percent difference for the serial dilution was greater than 10%, indicating a possible matrix interference in the sample.
- M The duplicate injection precision was not met.
- N The Matrix Spike sample recovery is not within control limits. See case narrative.
- S The reported value was determined by the Method of Standard Additions (MSA).
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.  
*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- W The post-digestion spike for furnace AA analysis is out of control limits, while sample absorbance is less than 50% of spike absorbance.
- i The MRL/MDL or LOQ/LOD is elevated due to a matrix interference.
- X See case narrative.
- + The correlation coefficient for the MSA is less than 0.995.
- Q See case narrative. One or more quality control criteria was outside the limits.

### Organic Data Qualifiers

- \* The result is an outlier. See case narrative.
- # The control limit criteria is not applicable. See case narrative.
- A A tentatively identified compound, a suspected aldol-condensation product.
- B The analyte was found in the associated method blank at a level that is significant relative to the sample result as defined by the DOD or NELAC standards.
- C The analyte was qualitatively confirmed using GC/MS techniques, pattern recognition, or by comparing to historical data.
- D The reported result is from a dilution.
- E The result is an estimated value.
- J The result is an estimated value.
- N The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
- P The GC or HPLC confirmation criteria was exceeded. The relative percent difference is greater than 40% between the two analytical results.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.  
*DOD-QSM 4.2 definition* : Analyte was not detected and is reported as less than the LOD or as defined by the project. The detection limit is adjusted for dilution.
- i The MRL/MDL or LOQ/LOD is elevated due to a chromatographic interference.
- X See case narrative.
- Q See case narrative. One or more quality control criteria was outside the limits.

### Additional Petroleum Hydrocarbon Specific Qualifiers

- F The chromatographic fingerprint of the sample matches the elution pattern of the calibration standard.
- L The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of lighter molecular weight constituents than the calibration standard.
- H The chromatographic fingerprint of the sample resembles a petroleum product, but the elution pattern indicates the presence of a greater amount of heavier molecular weight constituents than the calibration standard.
- O The chromatographic fingerprint of the sample resembles an oil, but does not match the calibration standard.
- Y The chromatographic fingerprint of the sample resembles a petroleum product eluting in approximately the correct carbon range, but the elution pattern does not match the calibration standard.
- Z The chromatographic fingerprint does not resemble a petroleum product.

**Columbia Analytical Services, Inc. dba ALS Environmental (ALS) - Kelso**  
**State Certifications, Accreditations, and Licenses**

Agency	Web Site	Number
Alaska DEC UST	<a href="http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx">http://dec.alaska.gov/applications/eh/ehllabreports/USTLabs.aspx</a>	UST-040
Arizona DHS	<a href="http://www.azdhs.gov/lab/license/env.htm">http://www.azdhs.gov/lab/license/env.htm</a>	AZ0339
Arkansas - DEQ	<a href="http://www.adeq.state.ar.us/techsvs/labcert.htm">http://www.adeq.state.ar.us/techsvs/labcert.htm</a>	88-0637
California DHS (ELAP)	<a href="http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx">http://www.cdph.ca.gov/certlic/labs/Pages/ELAP.aspx</a>	2286
DOD ELAP	<a href="http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm">http://www.denix.osd.mil/edqw/Accreditation/AccreditedLabs.cfm</a>	L12-28
Florida DOH	<a href="http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm">http://www.doh.state.fl.us/lab/EnvLabCert/WaterCert.htm</a>	E87412
Georgia DNR	<a href="http://www.gaepd.org/Documents/techguide_pcb.html#cel">http://www.gaepd.org/Documents/techguide_pcb.html#cel</a>	881
Hawaii DOH	Not available	-
Idaho DHW	<a href="http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx">http://www.healthandwelfare.idaho.gov/Health/Labs/CertificationDrinkingWaterLabs/tabid/1833/Default.aspx</a>	-
Indiana DOH	<a href="http://www.in.gov/isdh/24859.htm">http://www.in.gov/isdh/24859.htm</a>	C-WA-01
ISO 17025	<a href="http://www.pjllabs.com/">http://www.pjllabs.com/</a>	L12-27
Louisiana DEQ	<a href="http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx">http://www.deq.louisiana.gov/portal/DIVISIONS/PublicParticipationandPermitSupport/LouisianaLaboratoryAccreditationProgram.aspx</a>	3016
Louisiana DHH	Not available	LA110003
Maine DHS	Not available	WA0035
Michigan DEQ	<a href="http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html">http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156---,00.html</a>	9949
Minnesota DOH	<a href="http://www.health.state.mn.us/accreditation">http://www.health.state.mn.us/accreditation</a>	053-999-368
Montana DPHHS	<a href="http://www.dphhs.mt.gov/publichealth/">http://www.dphhs.mt.gov/publichealth/</a>	CERT0047
Nevada DEP	<a href="http://ndep.nv.gov/bsdwlabservice.htm">http://ndep.nv.gov/bsdwlabservice.htm</a>	WA35
New Jersey DEP	<a href="http://www.nj.gov/dep/oqa/">http://www.nj.gov/dep/oqa/</a>	WA005
New Mexico ED	<a href="http://www.nmenv.state.nm.us/dwb/Index.htm">http://www.nmenv.state.nm.us/dwb/Index.htm</a>	-
North Carolina DWQ	<a href="http://www.dwqlab.org/">http://www.dwqlab.org/</a>	605
Oklahoma DEQ	<a href="http://www.deq.state.ok.us/CSDnew/labcert.htm">http://www.deq.state.ok.us/CSDnew/labcert.htm</a>	9801
Oregon - DEQ (NELAP)	<a href="http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx">http://public.health.oregon.gov/LaboratoryServices/EnvironmentalLaboratoryAccreditation/Pages/index.aspx</a>	WA200001
South Carolina DHEC	<a href="http://www.scdhec.gov/environment/envserv/">http://www.scdhec.gov/environment/envserv/</a>	61002
Texas CEQ	<a href="http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html">http://www.tceq.texas.gov/field/qa/env_lab_accreditation.html</a>	704427-08-TX
Washington DOE	<a href="http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html">http://www.ecy.wa.gov/programs/eap/labs/lab-accreditation.html</a>	C1203
Wisconsin DNR	<a href="http://dnr.wi.gov/">http://dnr.wi.gov/</a>	998386840
Wyoming (EPA Region 8)	<a href="http://www.epa.gov/region8/water/dwhome/wyomingdi.html">http://www.epa.gov/region8/water/dwhome/wyomingdi.html</a>	-
Kelso Laboratory Website	<a href="http://www.caslab.com">www.caslab.com</a>	NA

Analyses were performed according to our laboratory's NELAP-approved quality assurance program. A complete listing of specific NELAP-certified analytes, can be found in the certification section at [www.caslab.com](http://www.caslab.com) or at the accreditation bodies web

Please refer to the certification and/or accreditation body's web site if samples are submitted for compliance purposes. The states highlighted above, require the analysis be listed on the state certification if used for compliance purposes and if the method/analyte is offered by that state.



## **Case Narrative**



## ALS ENVIRONMENTAL

Client: Washington State Department of Ecology  
Project: Frontier Hardchrome  
Sample Matrix: Water

Service Request No.: K1210496  
Date Received: 10/17/12

### CASE NARRATIVE

All analyses were performed consistent with the quality assurance program of ALS Environmental. This report contains analytical results for samples designated for Tier IV validation deliverables including summary forms and all of the associated raw data for each of the analyses. When appropriate to the method, method blank results have been reported with each analytical test.

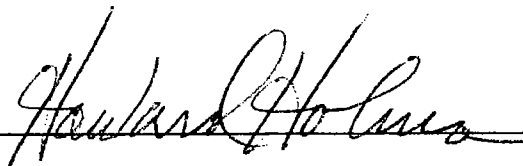
#### Sample Receipt

One water sample was received for analysis at ALS Environmental on 10/17/12. The samples were received in good condition and consistent with the accompanying chain of custody form. The samples were stored in a refrigerator at 4°C upon receipt at the laboratory.

#### General Chemistry Parameters

No anomalies associated with the analysis of these samples were observed.

Approved by





## **Chain of Custody**





SR#:

COC #

PAGE 1 OF 1

PROJECT NAME <b>FRONTIER HARDCHROME</b>					<div>NUMBER OF CONTAINERS</div> <div>Semivolatile Organics by GC/MS 825 <input type="checkbox"/> 8270 <input type="checkbox"/> 8270LL <input type="checkbox"/> Volatile Organics 824 <input type="checkbox"/> 8260 <input type="checkbox"/> 8021 <input type="checkbox"/> BTEX <input type="checkbox"/> Gas <input type="checkbox"/> Diesel <input type="checkbox"/> Oil <input type="checkbox"/> Fuel Fingerprint (FIO) <input type="checkbox"/> Oil &amp; Grease/TRPH <input type="checkbox"/> 1664 HEM <input type="checkbox"/> 1664 SGT <input type="checkbox"/> PCB's <input type="checkbox"/> Aroclors <input type="checkbox"/> Congeners <input type="checkbox"/> 508 <input type="checkbox"/> 8081A <input type="checkbox"/> Chlorophenolics - 8141A <input type="checkbox"/> 8151A <input type="checkbox"/> Tri <input type="checkbox"/> Tetra <input type="checkbox"/> PCP <input type="checkbox"/> PAHS 8310 <input type="checkbox"/> SIM <input type="checkbox"/> Metals, Total or Dissolved (See list below) <input checked="" type="checkbox"/> Cyanide <input type="checkbox"/> Hex-Chrom <input checked="" type="checkbox"/> pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS (circle) NH3-N, COD, Total-P, TKN, TOC, DOC (circle) NO2+NO3 TOX 9020 <input type="checkbox"/> AOX 1650 <input type="checkbox"/> 506 <input type="checkbox"/></div>														
PROJECT NUMBER <b>1210057</b>																			
PROJECT MANAGER <b>GUY BARRETT / BRIAN REILLY</b>																			
COMPANY ADDRESS <b>WA STATE DEPT OF ECOLOGY / WESTON</b>																			
CITY/STATE/ZIP																			
E-MAIL ADDRESS <b>BRIAN: brian.reilly@westonsolutions.com</b>																			
PHONE # <b>617 (360) 407-7115</b>																			
FAX # <b>BRIAN: (541) 593-3800</b>																			
SAMPLE S SIGNATURE 																			
SAMPLE I.D.																			
DATE																			
TIME																			
LAB I.D.																			
MATRIX																			
i																			
24-HOUR TIME																			
REPORT REQUIREMENTS																			
I. Routine Report: Method Blank, Surrogate, as required																			
II. Report Dup., MS, MSD as required																			
III. Data Validation Report (includes all raw data)																			
IV. CLP Deliverable Report																			
V. EDD																			
INVOICE INFORMATION																			
P.O. #																			
Bill To:																			
TURNAROUND REQUIREMENTS																			
24 hr. 48 hr.																			
5 Day																			
Standard (10-15 working days)																			
Provide FAX Results																			
Requested Report Date																			
Circle which metals are to be analyzed:																			
Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Ti Sn V Zn Hg																			
Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Ti Sn V Zn Hg																			
*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: (CIRCLE ONE)																			
SPECIAL INSTRUCTIONS/COMMENTS:																			
Sample Shipment contains USDA regulated soil samples (check box if applicable)																			
RELINQUISHED BY:																			
Signature																			
Date/Time																			
Printed Name																			
RECEIVED BY:																			
Signature																			
Date/Time																			
Printed Name																			





PC A2

### Cooler Receipt and Preservation Form

Client / Project: Western WA DOE / Frontier Hardware Service Request K12 10494  
Received: 10/17/12 Opened: 10/17/12 By: KST Unloaded: 10/17/12 By: KST

1. Samples were received via? ☐ Mail ☐ Fed Ex ☐ UPS ☐ DHL ☐ PDX ☒ Courier ☐ Hand Delivered  
2. Samples were received in: (circle) ☒ Cooler ☐ Box ☐ Envelope ☐ Other NA  
3. Were custody seals on coolers? ☐ NA ☐ Y ☒ N If yes, how many and where? \_\_\_\_\_  
If present, were custody seals intact? ☐ Y ☐ N If present, were they signed and dated? ☐ Y ☐ N

Raw Temp	Corr. Temp	Raw Blank	Corr. Blank	Corr. Factor	Thermometer ID	Cooler/COC ID	Tracking Number	Filed
3.3	3.3	2.9	2.9	0	287	NA	NA	

4. Packing material: ☐ Inserts ☐ Baggies ☒ Bubble Wrap ☒ Gel Packs ☐ Wet Ice ☐ Dry Ice ☐ Sleeves \_\_\_\_\_  
5. Were custody papers properly filled out (ink, signed, etc.)? ☐ NA ☒ Y ☐ N  
6. Did all bottles arrive in good condition (unbroken)? *Indicate in the table below.* ☐ NA ☒ Y ☐ N  
7. Were all sample labels complete (i.e analysis, preservation, etc.)? ☐ NA ☒ Y ☐ N  
8. Did all sample labels and tags agree with custody papers? *Indicate major discrepancies in the table on page 2.* ☐ NA ☒ Y ☐ N  
9. Were appropriate bottles/containers and volumes received for the tests indicated? ☐ NA ☒ Y ☐ N  
10. Were the pH-preserved bottles (*see SMO GEN SOP*) received at the appropriate pH? *Indicate in the table below* ☒ NA ☐ Y ☐ N  
11. Were VOA vials received without headspace? *Indicate in the table below.* ☒ NA ☐ Y ☐ N  
12. Was C12/Res negative? ☒ NA ☐ Y ☐ N

Sample ID on Bottle	Sample ID on COC	Identified by:

Sample ID	Bottle Count Bottle Type	Out of Temp	Head-space	Broke	pH	Reagent	Volume added	Reagent Lot Number	Initials	Time

Notes, Discrepancies, & Resolutions: \_\_\_\_\_

SHORT HOLD TIME



## **General Chemistry Parameters**



**COLUMBIA ANALYTICAL SERVICES, INC.**

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## Analytical Report

**Client:** Washington State Department of Ecology  
**Project:** FRONTIER HARDCHROME/1210057  
**Sample Matrix:** Water  
**Analysis Method:** 7196A

**Service Request:** K1210496  
**Date Collected:** 10/17/12  
**Date Received:** 10/17/12  
**Units:** mg/L  
**Basis:** NA

**Chromium, Hexavalent**

Sample Name	Lab Code	Result	MRL	MDL	Dil.	Date Analyzed	Q
1210057-13	K1210496-001	ND U	0.050	0.004	1	10/18/12 09:30	
Method Blank	K1210496-MB	ND U	0.050	0.004	1	10/18/12 09:30	



**COLUMBIA ANALYTICAL SERVICES, INC.**

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## QA/QC Report

**Client:** Washington State Department of Ecology  
**Project** FRONTIER HARDCHROME/1210057  
**Sample Matrix:** Water

**Service Request:** K1210496  
**Date Collected:** 10/17/12  
**Date Received:** 10/17/12  
**Date Analyzed:** 10/18/12

**Replicate Sample Summary**  
**General Chemistry Parameters**

**Sample Name:** 1210057-13  
**Lab Code:** K1210496-001

**Units:** mg/L  
**Basis:** NA

<b>Analyte Name</b>	<b>Analysis Method</b>	<b>MRL</b>	<b>MDL</b>	<b>Sample Result</b>	<b>Duplicate Sample K1210496-001DUP Result</b>	<b>Average</b>	<b>RPD</b>	<b>RPD Limit</b>
Chromium, Hexavalent	7196A	0.050	0.004	ND	ND	NC	NC	20

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

Printed 10/19/2012 11:10:12 AM

Superset Reference: 12-0000227726 rev 00

**COLUMBIA ANALYTICAL SERVICES, INC.**

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QA/QC Report

**Client:** Washington State Department of Ecology  
**Project:** FRONTIER HARDCHROME/1210057  
**Sample Matrix:** Water

**Service Request:** K1210496  
**Date Collected:** 10/17/12  
**Date Received:** 10/17/12  
**Date Analyzed:** 10/18/12

**Duplicate Matrix Spike Summary  
Chromium, Hexavalent**

**Sample Name:** 1210057-13  
**Lab Code:** K1210496-001  
**Analysis Method:** 7196A

**Units:** mg/L  
**Basis:** NA

Analyte Name	Sample Result	Matrix Spike K1210496-001MS			Duplicate Matrix Spike K1210496-001DMS			% Rec Limits	RPD	RPD Limit
		Result	Spike Amount	% Rec	Result	Spike Amount	% Rec			
Chromium, Hexavalent	ND	0.350	0.400	88	0.352	0.400	88	75-125	<1	20

Results flagged with an asterisk (\*) indicate values outside control criteria.

Results flagged with a pound (#) indicate the control criteria is not applicable.

Percent recoveries and relative percent differences (RPD) are determined by the software using values in the calculation which have not been rounded.

**COLUMBIA ANALYTICAL SERVICES, INC.**

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QA/QC Report

**Client:** Washington State Department of Ecology  
**Project:** FRONTIER HARDCHROME/1210057  
**Sample Matrix:** Water

**Service Request:** K1210496**Date Analyzed:** 10/18/12

**Lab Control Sample Summary**  
**Chromium, Hexavalent**

**Analysis Method:** 7196A**Units:** mg/L**Basis:** NA**Analysis Lot:** 314513

<b>Sample Name</b>	<b>Lab Code</b>	<b>Result</b>	<b>Spike Amount</b>	<b>% Rec</b>	<b>% Rec Limits</b>
Lab Control Sample	K1210496-LCS	0.755	0.742	102	80-120



**COLUMBIA ANALYTICAL SERVICES, INC.**

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QA/QC Report

Client: Washington State Department of Ecology  
Project: FRONTIER HARDCHROME/1210057

Service Request: K1210496

**Continuing Calibration Verification (CCV) Summary****Chromium, Hexavalent**

Analysis Method: 7196A

Units: mg/L

	Analysis Lot	Lab Code	Date Analyzed	True Value	Measured Value	Percent Recovery	Acceptance Limits
CCV1	314513	KQ1212311-05	10/18/12 09:30	0.500	0.529	106	90-110
CCV2	314513	KQ1212311-06	10/18/12 09:30	0.500	0.529	106	90-110

**COLUMBIA ANALYTICAL SERVICES, INC.**

Now part of the ALS Group

QA/QC Report

**Client:** Washington State Department of Ecology  
**Project:** FRONTIER HARDCHROME/1210057

**Service Request:** K1210496

**Continuing Calibration Blank (CCB) Summary**  
**Chromium, Hexavalent**

**Analysis Method:** 7196A**Units:** mg/L

	<b>Analysis Lot</b>	<b>Lab Code</b>	<b>Date Analyzed</b>	<b>MRL</b>	<b>MDL</b>	<b>Result</b>	<b>Q</b>
CCB1	314513	KQ1212311-03	10/18/12 09:30	0.050	0.004	ND	U
CCB2	314513	KQ1212311-04	10/18/12 09:30	0.050	0.004	ND	U

Work Request # 10796

Tier: IV

Date Analyzed: 10/18/12

Analyst: IF

Analysis: Crb (719A)

RUN# 314513

### DATA QUALITY REPORT INORGANICS

Explain any "no" responses to questions below, and any corrective actions in the comments section below.

1. Is the method name and number correct and appropriate? yes/no/NA
2. Holding times met for all analyses and for all samples? yes/no/NA
3. Are calculations correct? yes/no/NA
4. Is the reporting basis correct? (Dry Weight) yes/no/NA
5. All quality control criteria met? yes/no
6. Is the calibration curve correlation coefficient  $\geq 0.995$ ? yes/no/NA
7. MBs, CCVs, CCBs, LCSs, Dups, and Spikes, analyzed at proper frequency? yes/no/NA
8. Are ICVs, CCVs, and CCBs all within acceptance limits? yes/no/NA
9. Are results for methods blanks all ND? yes/no/NA
10. Are all QC samples within acceptance criteria? (LCS % rec, MS/DMS % rec, DUP or MS/DMS RPDs, etc.) yes/no/NA
11. Are all exceptions explained? yes/no/NA
12. Have all applicable service requests been reviewed? yes/no/NA
13. Are all samples labeled correctly? yes/no/NA
14. Have all instructions on the service request been followed? (e.g. Special MRLs, QC on a specific sample, Form V) yes/no/NA
15. Are detection limits and units reported correctly? yes/no/NA
16. Is the unused space on the benchsheet crossed out? yes/no/NA
17. Was analysis turned in by the due date? (n-2) (If not record SR#) yes/no/NA

COMMENTS:

Final Approved by: [Signature] Date: 10/18/12

DQREPORT



# Analytical Results Summary

Instrument Name: K-DAA-01

Analyst: IFRANKS

Analysis Lot: 314513 Method/Testcode: 7196A/Cr6

Lab Code	Target Analytes	QC	Parent Sample	Matrix	Raw Result	Sample Amt.	Final Result	Dil	MDL	PQL	% Rec	% RSD	Date Analyzed	QC?	Tier
Q1210496-001	Chromium, Hexavalent	N/A		Water	0.00 mg/L	50 mL	0.050 mg/L U	1	0.004	0.050			10/18/12 09:30:00	N	IV
Q1212311-01	Chromium, Hexavalent	MB		Water	-0.01 mg/L	50 mL	0.050 mg/L U	1	0.004	0.050			10/18/12 09:30:00	N	IV
Q1212311-02	Chromium, Hexavalent	LCS		Water	0.75 mg/L	50 mL	0.755 mg/L	1	0.004	0.050	102		10/18/12 09:30:00	N	IV
Q1212311-03	Chromium, Hexavalent	CCB		Water	-0.01 mg/L	50 mL	0.050 mg/L U	1	0.004	0.050			10/18/12 09:30:00	N	IV
Q1212311-04	Chromium, Hexavalent	CCB		Water	0.00 mg/L	50 mL	0.050 mg/L U	1	0.004	0.050			10/18/12 09:30:00	N	IV
Q1212311-05	Chromium, Hexavalent	CCV		Water	0.53 mg/L	50 mL	0.529 mg/L	1					10/18/12 09:30:00	N	IV
Q1212311-06	Chromium, Hexavalent	CCV		Water	0.53 mg/L	50 mL	0.529 mg/L	1					10/18/12 09:30:00	N	IV
Q1212311-07	Chromium, Hexavalent	MS	K1210496-001	Water	0.35 mg/L	50 mL	0.350 mg/L	1	0.004	0.050	88		10/18/12 09:30:00	N	IV
Q1212311-08	Chromium, Hexavalent	DMS	K1210496-001	Water	0.35 mg/L	50 mL	0.352 mg/L	1	0.004	0.050	88	<1	10/18/12 09:30:00	N	IV
Q1212311-09	Chromium, Hexavalent	DUP	K1210496-001	Water	0.00 mg/L	50 mL	0.050 mg/L U	1	0.004	0.050		NC	10/18/12 09:30:00	N	IV

IF 10/18/12  
Dec 10/18/12

indicates Final Result is not yet adjusted for Solids because it has not yet been determined.

## ALS- Environmental

1317 S 13th

Kelso

WA 98626

Phone : (360) 577-7222

0930AM

IF 10/18/12

Cr6, K10496

Method : WCR6 -Unit [ mg/L ] - Cr6+ 0.05 to 1.0 mg/l SM 3500 -Cr-B

Smp#/[Dil Fact]	Sample ID	Conc	OD	%Recovery/RPD	Analysis Time
DIL-1	RBL	0.0000	0.0003	0.00	9:29:46
DIL-1	RBL	0.0000	0.0004	0.00	9:30:04
ST-3	<i>cel</i> 3CCB (0 mg/L)	-0.0057	-0.0004	0.00	9:30:22
ST-2	<i>cel</i> 3CCV (0.5 mg/L)	0.5291	0.3169	105.82	9:30:40
1	MB	-0.0057	-0.0004	0.00	9:30:58
2	LCS	0.7549	0.4508	0.00	9:31:16
3	K1210496-001	-0.0049	0.0002	0.00	9:31:34
4	K1210496-001D	-0.0046	0.0004	0.00	9:31:52
5	K1210496-001MS	0.3504	0.2109	0.00	9:34:34
6	K1210496-001DMS	0.3519	0.2118	0.00	9:34:52
7-[1/10]	K1210496-001-DIL	-0.0470	0.0003	0.00	9:35:10
8-[1/10]	K1210496-001D-DIL	-0.0490	0.0002	0.00	9:35:28
9-[1/10]	K1210496-001MS-DIL	2.1780	0.1323	0.00	9:35:46
10-[1/10]	K1210496-001DMS-DIL	2.1970	0.1334	0.00	9:36:04
ST-3	<i>cel</i> 3CCB (0 mg/L)	-0.0049	0.0002	0.00	9:36:22
ST-2	<i>cel</i> 3CCV (0.5 mg/L)	0.5288	0.3167	105.76	9:36:40

per 10/18/12

Report Date :10/18/2012

Run Date :10/18/2012

Operator :WESTCO

Plan # :20121018002

Plan Description : CR6 101812

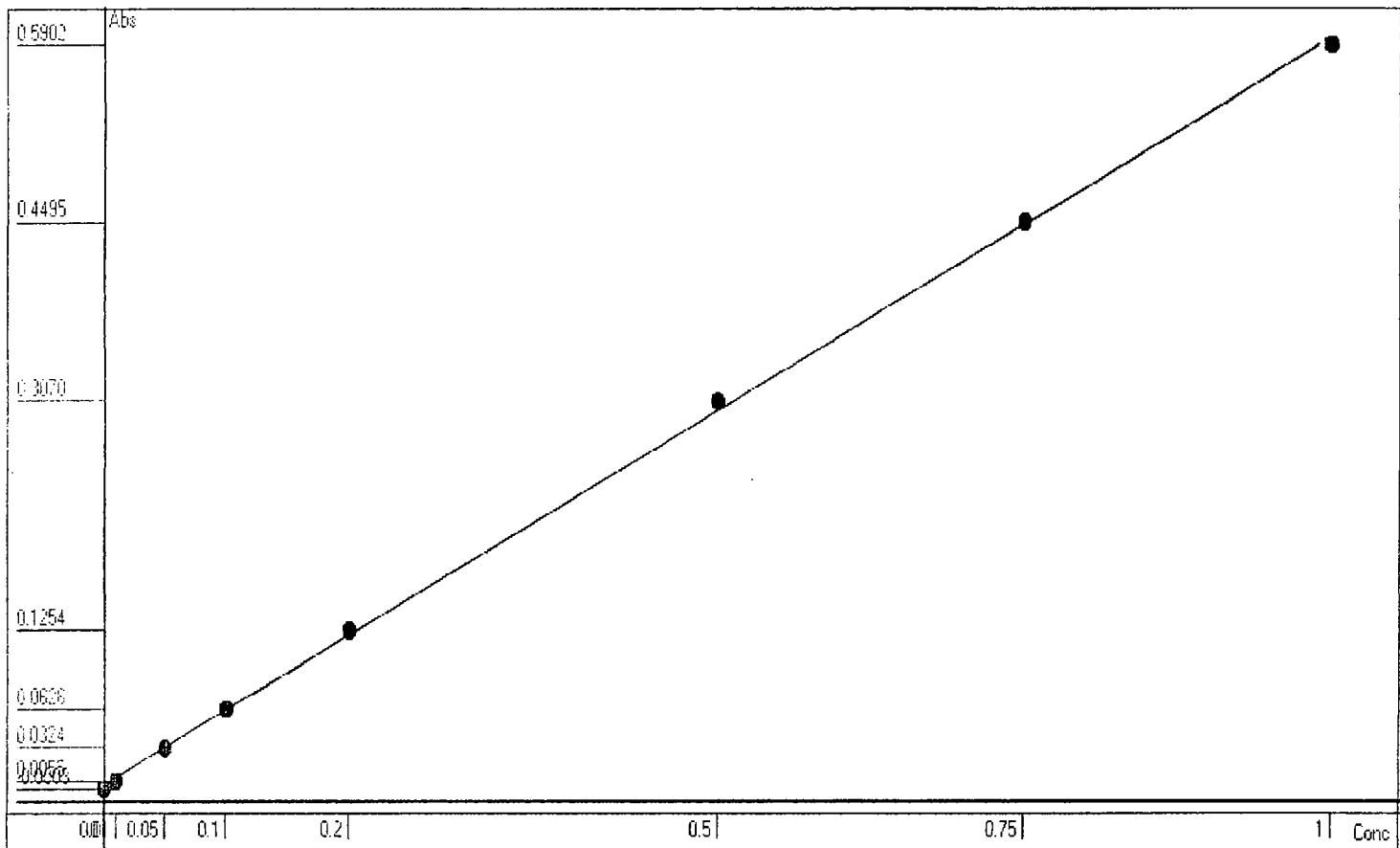
# Calibrant Report - WCR6 -

17/10/18/12

Cr6

Calib Lot #:Cr6+ Exp Date:12/12/2012 User:CAS-GEN CHEM

Plan #: 20121017005 Description : [CR6101712] Unit [ mg/L ]



Point	OD	Conc	Recalc Conc	% Error
1	-0.0003	0	-0.0057	-0.57
2	0.0055	0.01	0.0041	-59.00
3	0.0324	0.05	0.0494	-1.20
4	0.0626	0.1	0.1004	0.40
5	0.1254	0.2	0.2062	3.10
6	0.3070	0.5	0.5125	2.50
7	0.4495	0.75	0.7527	0.36
8	0.5902	1	0.9900	-1.00

Conc= +1.6862\*Abso -0.0052 R<sup>2</sup>=0.9996

RBL

Report Date 10/17/2012 Run Date 7/16/2012

Dec 11/18/12



## COLUMBIA ANALYTICAL SERVICES, INC.

STARLIMS RUN# 314513

Method: 7196A

Analysis Cr6

LCS ID: Gen-Cr6/2-9-R T.V.= 0.742

CURVE ID: Gen -Cr6/2-16-FF

CCV ID: Gen-Cr6/2-27-T T.V.=0.50ppm

Spike ID: Gen-Cr6/2-5-O TV MS/DMS = 0.40 PPM

0.2N H2SO4 ID : Gen-Cr6/2-51-B

DiphenylCarbazide Solution ID: Gen-Cr6/2-81-K

PALL - GN-6 0.45um 47mm FI T12717

Pipette ID: 139246, 2011155, 3610442

Equipment ID: K-DAA-01

Analyzed By: IF	Date Analyzed: 10/18/2012
Reviewed By: <i>ll</i>	Date Reviewed: 10/18/12

**Manchester Environmental Laboratory**  
7411 Beach Drive E, Port Orchard, Washington 98366

**Case Narrative**

October 29, 2012

Project: General Chemistry Frontier Hardchrome-2012

Work Order: 1210057

Project  
Manager: Barrett, Guy

By: Dean Momohara<sub>or</sub>

**Summary**

The laboratory analyzed the samples following EPA 300.0 for sulfate.

All analyses requested were evaluated by established regulatory quality assurance guidelines.

**Sample Information**

The samples were received at the Manchester Laboratory on 10/23/2012. The coolers were received within the proper temperature range of 0°C - 6°C. The samples were received in good condition. Five samples were received and assigned laboratory identification numbers 03, 04, 06, 11 and 13.

**Holding Times**

The laboratory performed all analyses within their hold times.

**Calibration**

The instrument was calibrated following the appropriate method. All initial and continuing calibration verification checks were within the acceptance limits. All initial and continuing blank checks were within the acceptance limits. The r-value was within the acceptance limits. All standard residuals were within acceptance limits. The instrument was calibrated with NIST traceable standards and verified to be in calibration with second source NIST traceable standards.

### **Method Blanks**

No analytically significant level of analyte was detected in the method blank associated with these samples.

### **Laboratory Control Samples**

The laboratory control sample recovery was within the acceptance limits.

### **Replicates**

The duplicate relative percent difference of samples with concentrations greater than 5 times the reporting limit was within the acceptance limits.

### **Matrix Spikes**

The matrix spike recovery was within the acceptance limits.

### **Other Quality Assurance Measures and Issues**

U - The analyte was not detected at or above the reported result.

**bold** - The analyte was present in the sample. (Visual Aid to locate detected compounds on report sheet.)

Please call Dean Momohara at (360) 871-8808 to further discuss this project.

cc: Project File



**Washington State Department of Ecology  
Manchester Environmental Laboratory  
Final Analysis Report for  
Sulfate**

**Project Name: Frontier Hardchrome-2012**

**Work Order: 1210057  
Project Officer: Barrett, Guy  
Date Collected: 10/16/2012**

**Analyte: Sulfate  
Method: EPA300.0  
Date Analyzed: 10/25/2012**

**Matrix: Water  
Units: mg/L**

Sample #	Sample ID	Result	Qualifier	RL	MDL	Collected	Analyzed	Batch ID
1210057-03	W85-6A	22.2		0.30	0.10	10/16/12	10/25/12	B12J164
1210057-04	QA-1	22.1		0.30	0.10	10/16/12	10/25/12	B12J164
1210057-06	W99-R5A	14.6		0.30	0.10	10/16/12	10/25/12	B12J164
1210057-11	B85-4	54.9		0.30	0.10	10/17/12	10/25/12	B12J164
1210057-13	B87-8	62.5		0.60	0.19	10/17/12	10/25/12	B12J164

**QC Results for Batch ID: B12J164**

Method Blank	Sample ID	Result	Qualifier	RL	MDL	Analyzed			
B12J164-BLK1	Blank	0.30	U	0.30	0.10	10/25/12			

Sample #	QC Sample	Result	Spike Level	Source Sample	Source Result	%Rec	%Rec Limits	RPD	RPD Limit
B12J164-BS1	LCS	4.93	5			99	90-110		
B12J164-DUP1	Duplicate	22.1		1210057-03	22.2			0.3	20
B12J164-MS1	Matrix Spike	27.2	5	1210057-04	22.1	103	75-125		

Authorized by: DM

Release Date: 10/29/12

Page 1 of 1  
10/29/2012

## ANALYTICAL REPORT

Job Number: 580-35682-1

Job Description: Frontier Hardchrome 2012

For:

Washington State Dept of Ecology  
Manchester Environmental Laboratory  
7411 Beach Drive East  
Port Orchard, WA 98366

Attention: Ms. Karin Feddersen



Approved for release:  
Kristine Allen  
Project Manager I  
11/14/2012 4:08 PM

---

Kristine Allen  
Project Manager I  
kristine.allen@testamericainc.com  
11/14/2012

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This report shall not be reproduced except in full, without prior express written approval by the laboratory. The results relate only to the item(s) tested and the sample(s) as received by the laboratory.

The results included in this report have been reviewed for compliance with the laboratory QA/QC plan and meet all requirements of NELAP. All data have been found to be compliant with laboratory protocol, with the exception of any items noted in the case narrative.

**TestAmerica Laboratories, Inc.**

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## CASE NARRATIVE

Client: Washington State Dept of Ecology  
Project: Frontier Hardchrome 2012  
Report Number: 580-35682-1

This case narrative is in the form of an exception report, where only the anomalies related to this report, method specific performance and/or QA/QC issues are discussed. If there are no issues to report, this narrative will include a statement that documents that there are no relevant data issues.

It should be noted that samples with elevated Reporting Limits (RLs) resulting from a dilution may not be able to satisfy customer reporting limits in some cases. Such increases in the RLs are an unavoidable but acceptable consequence of sample dilution that enables quantification of target analytes within the calibration range of the instrument or that reduces the interferences thereby enabling the quantification of target analytes.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

### RECEIPT

The samples were received on 10/26/2012; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 5.8 C.

The sample collection dates and times were not listed on the COC; samples were logged in per container labels for sample dates and times.

Note: All samples which require thermal preservation are considered acceptable if the arrival temperature is within 2C of the required temperature or method specified range. For samples with a specified temperature of 4C, samples with a temperature ranging from just above freezing temperature of water to 6C shall be acceptable. Samples that are hand delivered immediately following collection may not meet these criteria, however they will be deemed acceptable according to NELAC standards, if there is evidence that the chilling process has begun, such as arrival on ice, etc.

### TOTAL METALS (ICP)

Samples 1210057-03 (580-35682-1), 1210057-06 (580-35682-2), 1210057-11 (580-35682-3) and 1210057-13 (580-35682-4) were analyzed for total metals (ICP) in accordance with EPA Method 200.7. The samples were prepared and analyzed on 11/01/2012 and 11/08/2012.

No difficulties were encountered during the metals analyses.

All quality control parameters were within the acceptance limits.

## SAMPLE SUMMARY

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
580-35682-1	1210057-03	Water	10/16/2012 0910	10/26/2012 0950
580-35682-2	1210057-06	Water	10/16/2012 1215	10/26/2012 0950
580-35682-3	1210057-11	Water	10/17/2012 0850	10/26/2012 0950
580-35682-4	1210057-13	Water	10/17/2012 1030	10/26/2012 0950



## EXECUTIVE SUMMARY - Detections

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

Lab Sample ID Analyte	Client Sample ID	Result	Qualifier	Reporting Limit	Units	Method
580-35682-1 Sulfur	1210057-03	7.9		0.50	mg/L	200.7 Rev 4.4
580-35682-2 Sulfur	1210057-06	5.1		0.50	mg/L	200.7 Rev 4.4
580-35682-3 Sulfur	1210057-11	20		0.50	mg/L	200.7 Rev 4.4
580-35682-4 Sulfur	1210057-13	22		0.50	mg/L	200.7 Rev 4.4

## METHOD SUMMARY

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

Description	Lab Location	Method	Preparation Method
<b>Matrix: Water</b>			
Metals (ICP)	TAL NSH	EPA 200.7 Rev 4.4	
Preparation, Total Metals	TAL NSH		EPA 200.7

### Lab References:

TAL NSH = TestAmerica Nashville

### Method References:

EPA = US Environmental Protection Agency

## METHOD / ANALYST SUMMARY

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

Method	Analyst	Analyst ID
EPA 200.7 Rev 4.4	Bydalek, Beth	bb



**Analytical Data**

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

Client Sample ID: 1210057-03

Lab Sample ID: 580-35682-1

Client Matrix: Water

Date Sampled: 10/16/2012 0910

Date Received: 10/26/2012 0950

**200.7 Rev 4.4 Metals (ICP)**

Analysis Method: 200.7 Rev 4.4

Analysis Batch: 490-32866

Instrument ID: ICP6

Prep Method: 200.7

Prep Batch: 490-32518

Lab File ID: TALS\_110112-6A.asc

Dilution: 1.0

Initial Weight/Volume: 50 mL

Analysis Date: 11/01/2012 1414

Final Weight/Volume: 50 mL

Prep Date: 11/01/2012 0640

Analyte	Result (mg/L)	Qualifier	RL
Sulfur	7.9		0.50

## Analytical Data

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

Client Sample ID: 1210057-06

Lab Sample ID: 580-35682-2

Client Matrix: Water

Date Sampled: 10/16/2012 1215

Date Received: 10/26/2012 0950

---

### 200.7 Rev 4.4 Metals (ICP)

Analysis Method: 200.7 Rev 4.4

Analysis Batch: 490-32866

Instrument ID: ICP6

Prep Method: 200.7

Prep Batch: 490-32518

Lab File ID: TALS\_110112-6A.asc

Dilution: 1.0

Initial Weight/Volume: 50 mL

Analysis Date: 11/01/2012 1417

Final Weight/Volume: 50 mL

Prep Date: 11/01/2012 0640

---

Analyte	Result (mg/L)	Qualifier	RL
Sulfur	5.1		0.50

---

**Analytical Data**

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

Client Sample ID: 1210057-11

Lab Sample ID: 580-35682-3

Date Sampled: 10/17/2012 0850

Client Matrix: Water

Date Received: 10/26/2012 0950

---

**200.7 Rev 4.4 Metals (ICP)**

Analysis Method: 200.7 Rev 4.4

Analysis Batch: 490-32866

Instrument ID: ICP6

Prep Method: 200.7

Prep Batch: 490-32518

Lab File ID: TALS\_110112-6A.asc

Dilution: 1.0

Initial Weight/Volume: 50 mL

Analysis Date: 11/01/2012 1421

Final Weight/Volume: 50 mL

Prep Date: 11/01/2012 0640

Analyte	Result (mg/L)	Qualifier	RL
Sulfur	20		0.50

**Analytical Data**

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

Client Sample ID: 1210057-13

Lab Sample ID: 580-35682-4

Date Sampled: 10/17/2012 1030

Client Matrix: Water

Date Received: 10/26/2012 0950

**200.7 Rev 4.4 Metals (ICP)**

Analysis Method: 200.7 Rev 4.4

Analysis Batch: 490-34611

Instrument ID: ICP6

Prep Method: 200.7

Prep Batch: 490-34375

Lab File ID: TALS\_110812-6RUSH

Dilution: 1.0

Initial Weight/Volume: 50 mL

Analysis Date: 11/08/2012 1150

Final Weight/Volume: 50 mL

Prep Date: 11/08/2012 0710

Analyte	Result (mg/L)	Qualifier	RL
Sulfur	22		0.50



# Quality Control Results

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

## Method Blank - Batch: 490-32518

## Method: 200.7 Rev 4.4

## Preparation: 200.7

Lab Sample ID: MB 490-32518/1-A  
Client Matrix: Water  
Dilution: 1.0  
Analysis Date: 11/01/2012 1339  
Prep Date: 11/01/2012 0640  
Leach Date: N/A

Analysis Batch: 490-32866  
Prep Batch: 490-32518  
Leach Batch: N/A  
Units: mg/L

Instrument ID: ICP6  
Lab File ID: TALS\_110112-6A.asc  
Initial Weight/Volume: 50 mL  
Final Weight/Volume: 50 mL

Analyte	Result	Qual	RL
Sulfur	ND		0.50

## Lab Control Sample - Batch: 490-32518

## Method: 200.7 Rev 4.4

## Preparation: 200.7

Lab Sample ID: LCS 490-32518/2-A  
Client Matrix: Water  
Dilution: 1.0  
Analysis Date: 11/01/2012 1342  
Prep Date: 11/01/2012 0640  
Leach Date: N/A

Analysis Batch: 490-32866  
Prep Batch: 490-32518  
Leach Batch: N/A  
Units: mg/L

Instrument ID: ICP6  
Lab File ID: TALS\_110112-6A.asc  
Initial Weight/Volume: 50 mL  
Final Weight/Volume: 50 mL

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Sulfur	1.00	1.06	106	85 - 115	

## Quality Control Results

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

### Method Blank - Batch: 490-34375

**Method: 200.7 Rev 4.4**  
**Preparation: 200.7**

Lab Sample ID:	MB 490-34375/1-A	Analysis Batch:	490-34611	Instrument ID:	ICP6
Client Matrix:	Water	Prep Batch:	490-34375	Lab File ID:	TALS_110812-6RUSHB
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	50 mL
Analysis Date:	11/08/2012 1054	Units:	mg/L	Final Weight/Volume:	50 mL
Prep Date:	11/08/2012 0710				
Leach Date:	N/A				

Analyte	Result	Qual	RL
Sulfur	ND		0.50

### Lab Control Sample - Batch: 490-34375

**Method: 200.7 Rev 4.4**  
**Preparation: 200.7**

Lab Sample ID:	LCS 490-34375/2-A	Analysis Batch:	490-34611	Instrument ID:	ICP6
Client Matrix:	Water	Prep Batch:	490-34375	Lab File ID:	TALS_110812-6RUSHB
Dilution:	1.0	Leach Batch:	N/A	Initial Weight/Volume:	50 mL
Analysis Date:	11/08/2012 1058	Units:	mg/L	Final Weight/Volume:	50 mL
Prep Date:	11/08/2012 0710				
Leach Date:	N/A				

Analyte	Spike Amount	Result	% Rec.	Limit	Qual
Sulfur	1.00	1.11	111	85 - 115	

## DATA REPORTING QUALIFIERS

Lab Section	Qualifier	Description
-------------	-----------	-------------

## Quality Control Results

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

### QC Association Summary

Lab Sample ID	Client Sample ID	Report Basis	Client Matrix	Method	Prep Batch
<b>Metals</b>					
<b>Prep Batch: 490-32518</b>					
LCS 490-32518/2-A	Lab Control Sample	T	Water	200.7	
MB 490-32518/1-A	Method Blank	T	Water	200.7	
580-35682-1	1210057-03	T	Water	200.7	
580-35682-2	1210057-06	T	Water	200.7	
580-35682-3	1210057-11	T	Water	200.7	
<b>Analysis Batch: 490-32866</b>					
LCS 490-32518/2-A	Lab Control Sample	T	Water	200.7 Rev 4.4	490-32518
MB 490-32518/1-A	Method Blank	T	Water	200.7 Rev 4.4	490-32518
580-35682-1	1210057-03	T	Water	200.7 Rev 4.4	490-32518
580-35682-2	1210057-06	T	Water	200.7 Rev 4.4	490-32518
580-35682-3	1210057-11	T	Water	200.7 Rev 4.4	490-32518
<b>Prep Batch: 490-34375</b>					
LCS 490-34375/2-A	Lab Control Sample	T	Water	200.7	
MB 490-34375/1-A	Method Blank	T	Water	200.7	
580-35682-4	1210057-13	T	Water	200.7	
<b>Analysis Batch: 490-34611</b>					
LCS 490-34375/2-A	Lab Control Sample	T	Water	200.7 Rev 4.4	490-34375
MB 490-34375/1-A	Method Blank	T	Water	200.7 Rev 4.4	490-34375
580-35682-4	1210057-13	T	Water	200.7 Rev 4.4	490-34375

#### Report Basis

T = Total



# Quality Control Results

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

## Laboratory Chronicle

Lab ID: 580-35682-1

Client ID: 1210067-03

Sample Date/Time: 10/16/2012 09:10

Received Date/Time: 10/26/2012 09:50

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:200.7	580-35682-A-1-A		490-32866	490-32518	11/01/2012 06:40	1	TAL NSH	SR
A:200.7 Rev 4.4	580-35682-A-1-A		490-32866	490-32518	11/01/2012 14:14	1	TAL NSH	bb

Lab ID: 580-35682-2

Client ID: 1210067-06

Sample Date/Time: 10/16/2012 12:15

Received Date/Time: 10/26/2012 09:50

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:200.7	580-35682-A-2-A		490-32866	490-32518	11/01/2012 06:40	1	TAL NSH	SR
A:200.7 Rev 4.4	580-35682-A-2-A		490-32866	490-32518	11/01/2012 14:17	1	TAL NSH	bb

Lab ID: 580-35682-3

Client ID: 1210067-11

Sample Date/Time: 10/17/2012 08:50

Received Date/Time: 10/26/2012 09:50

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:200.7	580-35682-A-3-A		490-32866	490-32518	11/01/2012 06:40	1	TAL NSH	SR
A:200.7 Rev 4.4	580-35682-A-3-A		490-32866	490-32518	11/01/2012 14:21	1	TAL NSH	bb

Lab ID: 580-35682-4

Client ID: 1210067-13

Sample Date/Time: 10/17/2012 10:30

Received Date/Time: 10/26/2012 09:50

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:200.7	580-35682-A-4-A		490-34611	490-34375	11/08/2012 07:10	1	TAL NSH	SR
A:200.7 Rev 4.4	580-35682-A-4-A		490-34611	490-34375	11/08/2012 11:50	1	TAL NSH	bb

Lab ID: MB

Client ID: N/A

Sample Date/Time: N/A

Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:200.7	MB 490-32518/1-A		490-32866	490-32518	11/01/2012 06:40	1	TAL NSH	SR
A:200.7 Rev 4.4	MB 490-32518/1-A		490-32866	490-32518	11/01/2012 13:39	1	TAL NSH	bb
P:200.7	MB 490-34375/1-A		490-34611	490-34375	11/08/2012 07:10	1	TAL NSH	SR
A:200.7 Rev 4.4	MB 490-34375/1-A		490-34611	490-34375	11/08/2012 10:54	1	TAL NSH	bb

## Quality Control Results

Client: Washington State Dept of Ecology

Job Number: 580-35682-1

### Laboratory Chronicle

Lab ID: LCS

Client ID: N/A

Sample Date/Time: N/A

Received Date/Time: N/A

Method	Bottle ID	Run	Analysis Batch	Prep Batch	Date Prepared / Analyzed	Dil	Lab	Analyst
P:200.7	LCS 490-32518/2-A		490-32866	490-32518	11/01/2012 06:40	1	TAL NSH	SR
A:200.7 Rev 4.4	LCS 490-32518/2-A		490-32866	490-32518	11/01/2012 13:42	1	TAL NSH	bb
P:200.7	LCS 490-34375/2-A		490-34611	490-34375	11/08/2012 07:10	1	TAL NSH	SR
A:200.7 Rev 4.4	LCS 490-34375/2-A		490-34611	490-34375	11/08/2012 10:58	1	TAL NSH	bb

### Lab References:

TAL NSH = TestAmerica Nashville

## REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Nashville

Job No.: 580-35682-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
MET 1:1HCL 00002	12/06/12	02/23/12	DI Water, Lot DI Water	1000 mL	MET_HCL_00001	500 mL	Hydrogen Chloride	50 %
.MET_HCL_00001	12/06/12		Fisher Scientific, Lot 4111010		(Purchased Reagent)		Hydrogen Chloride	100 %
MET 1:1HCL 00004	11/01/13	02/23/12	DI Water, Lot DI Water	1000 mL	MET_HCL_00012	500 mL	Hydrogen Chloride	50 %
.MET_HCL_00012	11/01/13		Macron Chemicals, Lot 0000013500		(Purchased Reagent)		Hydrogen Chloride	100 %
MET 1:1HNO3 00002	12/06/12	02/23/12	DI Water, Lot DI Water	1000 mL	MET_HNO3_00001	500 mL	Nitric acid	50 %
.MET_HNO3_00001	12/06/12		Macron Chemicals, Lot K35026		(Purchased Reagent)		Nitric acid	100 %
MET 1:1HNO3 00005	12/06/12	02/23/12	DI Water, Lot DI Water	1000 mL	MET_HNO3_00026	500 mL	Nitric acid	50 %
.MET_HNO3_00026	11/01/13		Macron Chemicals, Lot K47022		(Purchased Reagent)		Nitric acid	100 %
MET_CCV_00009	01/15/13	03/14/12	5% Nitric Acid, Lot 1	500 mL	MET_S_STOCK_00003	0.5 mL	Sulfur	1 ppm
.MET_S_STOCK_00003	01/18/14		ENVIRONMENTAL EXPRESS, Lot 1132501		(Purchased Reagent)		Sulfur	1000 ppm
MET_CSTD 0.5 00005	03/12/13	03/12/12	5% Nitric Acid, Lot 1	40 mL	MET_S_STOCK_00003	0.02 mL	Sulfur	0.5 ppm
.MET_S_STOCK_00003	01/18/14		ENVIRONMENTAL EXPRESS, Lot 1132501		(Purchased Reagent)		Sulfur	1000 ppm
MET_CSTD 10.0 00003	03/12/13	03/12/12	5% Nitric Acid, Lot 1	50 mL	MET_ICUS-3033_00006	49.5 mL	Sulfur	9.9 ppm
.MET_ICUS-3033_00006	11/30/14		Ultra Scientific, Lot P01099		(Purchased Reagent)		Sulfur	10 ppm
MET_CSTD 100 00003	03/12/13	03/12/12	5% Nitric Acid, Lot 1	50 mL	MET_S_STOCK_00003	5 mL	Sulfur	100 ppm
.MET_S_STOCK_00003	01/18/14		ENVIRONMENTAL EXPRESS, Lot 1132501		(Purchased Reagent)		Sulfur	1000 ppm
MET_CSTD 100 00004	03/12/13	03/12/12	5% Nitric Acid, Lot 1	50 mL	MET_S_STOCK_00003	5 mL	Sulfur	100 ppm
.MET_S_STOCK_00003	01/18/14		ENVIRONMENTAL EXPRESS, Lot 1132501		(Purchased Reagent)		Sulfur	1000 ppm
MET_CSTD 2.0 00005	03/12/13	03/12/12	5% Nitric Acid, Lot 1	40 mL	MET_S_STOCK_00003	0.1 mL	Sulfur	2.5 ppm
.MET_S_STOCK_00003	01/18/14		ENVIRONMENTAL EXPRESS, Lot 1132501		(Purchased Reagent)		Sulfur	1000 ppm
MET_CSTD 50 00003	03/12/13	03/12/12	5% Nitric Acid, Lot 1	50 mL	MET_S_STOCK_00003	2.5 mL	Sulfur	50 ppm
.MET_S_STOCK_00003	01/18/14		ENVIRONMENTAL EXPRESS, Lot 1132501		(Purchased Reagent)		Sulfur	1000 ppm
MET_CSTD 50 00004	03/12/13	03/12/12	5% Nitric Acid, Lot 1	50 mL	MET_S_STOCK_00003	2.5 mL	Sulfur	50 ppm
.MET_S_STOCK_00003	01/18/14		ENVIRONMENTAL EXPRESS, Lot 1132501		(Purchased Reagent)		Sulfur	1000 ppm
MET_ICSA_00003	01/15/13	03/14/12	5% Nitric Acid, Lot 1	250 mL	MET_INT-A1_00001	25 mL	Al	500 ppm
							Ca	500 ppm
							Fe	200 ppm
							Mg	500 ppm
.MET_INT-A1_00001	01/15/13		Spex, Lot 43-2AS		(Purchased Reagent)		Al	5000 ppm
							Ca	5000 ppm
							Fe	2000 ppm
							Mg	5000 ppm
MET_ICSAB_00003	10/30/12	03/14/12	5% Nitric Acid, Lot 1	250 mL	MET_INT-A1_00001	25 mL	Al	501 ppm
							Ca	500.1 ppm
							Fe	200.1 ppm
							Mg	500.1 ppm
					MET_INT-B1_00001	2.5 mL	Ag	1 ppm
							Ba	0.5 ppm
							Be	0.5 ppm
							Cd	1 ppm
							Co	0.5 ppm
							Cr	0.5 ppm
							Cu	0.5 ppm

## REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Nashville

Job No.: 580-35682-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
							Mn	0.5 ppm
							Ni	1 ppm
							Pb	1 ppm
							V	0.5 ppm
							Zn	1 ppm
					MET_INT-B2_00001	2.5 mL	Al	501 ppm
							As	1 ppm
							B	1 ppm
							Ca	500.1 ppm
							Fe	200.1 ppm
							Mg	500.1 ppm
							Mo	1 ppm
							Na	1 ppm
							Sb	1 ppm
							Se	1 ppm
							Tl	1 ppm
.MET_INT-A1_00001	01/15/13		Spex, Lot 43-2AS		(Purchased Reagent)		Al	5000 ppm
							Ca	5000 ppm
							Fe	2000 ppm
							Mg	5000 ppm
.MET_INT-B1_00001	10/30/12		Spex, Lot 43-33AS		(Purchased Reagent)		Ag	100 ppm
							Ba	50 ppm
							Be	50 ppm
							Cd	100 ppm
							Co	50 ppm
							Cr	50 ppm
							Cu	50 ppm
							Mn	50 ppm
							Ni	100 ppm
							Pb	100 ppm
							V	50 ppm
							Zn	100 ppm
.MET_INT-B2_00001	10/30/12		Spex, Lot 43-55AS		(Purchased Reagent)		Al	100 ppm
							As	100 ppm
							B	100 ppm
							Ca	10 ppm
							Fe	10 ppm
							Mg	10 ppm
							Mo	100 ppm
							Na	100 ppm
							Sb	100 ppm
							Se	100 ppm
							Tl	100 ppm
MET_ICV_00013	10/01/13	09/25/12	5% Nitric Acid, Lot 1	50 mL	MET_S_STOCK_00003	0.05 mL	Sulfur	1 ppm
.MET_S_STOCK_00003	01/18/14		ENVIRONMENTAL EXPRESS, Lot 1132501		(Purchased Reagent)		Sulfur	1000 ppm
MET_lab_CRI_00001	10/11/13	10/11/12	5% Nitric Acid, Lot 00001	50 mL	MET_QC_CRI_00002	5 mL	Sulfur	0.5 ppm



## REAGENT TRACEABILITY SUMMARY

Lab Name: TestAmerica Nashville

Job No.: 580-35682-1

SDG No.:

Reagent ID	Exp Date	Prep Date	Dilutant Used	Reagent Final Volume	Parent Reagent		Analyte	Concentration
					Reagent ID	Volume Added		
.MET_QC_CRI_00002	10/11/13	10/11/12	5% Nitric Acid, Lot 00001	1000 mL	MET_S_STOCK_00003	5000 uL	Sulfur	5 ppm
..MET_S_STOCK_00003	01/18/14	ENVIRONMENTAL EXPRESS, Lot 1132501			(Purchased Reagent)		Sulfur	1000 ppm
MET_QC_CRI2_00005	04/30/13	09/27/13	5% Nitric Acid, Lot 1	50 mL	MET_S_STOCK_00003	0.025 mL	Sulfur	0.5 ppm
.MET_S_STOCK_00003	01/18/14	ENVIRONMENTAL EXPRESS, Lot 1132501			(Purchased Reagent)		Sulfur	1000 ppm
MET_Spike_A_00005	09/25/13	Environmental Express, Lot 1226804			(Purchased Reagent)		Al	200 ppm
							As	5 ppm
							B	100 ppm
							Ba	200 ppm
							Be	5 ppm
							Ca	500 ppm
							Cd	5 ppm
							Co	50 ppm
							Cr	20 ppm
							Cu	25 ppm
							Fe	100 ppm
							K	500 ppm
							Li	100 ppm
							Mg	500 ppm
							Mn	50 ppm
							Na	500 ppm
							Ni	50 ppm
							Pb	5 ppm
							Se	5 ppm
							Sr	100 ppm
							Tl	5 ppm
							V	50 ppm
							Zn	50 ppm
MET_Spike_B_00004	09/25/13	Environmental Express, Lot 1226805			(Purchased Reagent)		Ag	5 ppm
							Mo	50 ppm
							Sb	10 ppm
							Sn	100 ppm
							Sulfur	100 ppm
							Ti	100 ppm

# Certification Summary

Client: Washington State Dept of Ecology  
Project/Site: Frontier Hardchrome 2012

TestAmerica Job ID: 580-35682-1

Laboratory	Authority	Program	EPA Region	Certification ID
TestAmerica Nashville		ACIL		393
TestAmerica Nashville	A2LA	ISO/IEC 17025		0453.07
TestAmerica Nashville	Alabama	State Program	4	41150
TestAmerica Nashville	Alaska (UST)	State Program	10	UST-087
TestAmerica Nashville	Arizona	State Program	9	AZ0473
TestAmerica Nashville	Arkansas DEQ	State Program	6	88-0737
TestAmerica Nashville	California	NELAC	9	1168CA
TestAmerica Nashville	Canadian Assoc Lab Accred	Canada		3744
TestAmerica Nashville	Colorado	State Program	8	N/A
TestAmerica Nashville	Connecticut	State Program	1	PH-0220
TestAmerica Nashville	Florida	NELAC	4	E87358
TestAmerica Nashville	Illinois	NELAC	5	200010
TestAmerica Nashville	Iowa	State Program	7	131
TestAmerica Nashville	Kansas	NELAC	7	E-10229
TestAmerica Nashville	Kentucky	State Program	4	90038
TestAmerica Nashville	Kentucky (UST)	State Program	4	19
TestAmerica Nashville	Louisiana	NELAC	6	30613
TestAmerica Nashville	Louisiana	NELAC	6	LA120025
TestAmerica Nashville	Maryland	State Program	3	316
TestAmerica Nashville	Massachusetts	State Program	1	M-TN032
TestAmerica Nashville	Minnesota	NELAC	5	047-999-345
TestAmerica Nashville	Mississippi	State Program	4	N/A
TestAmerica Nashville	Montana (UST)	State Program	8	NA
TestAmerica Nashville	Nevada	State Program	9	TN00032
TestAmerica Nashville	New Hampshire	NELAC	1	2963
TestAmerica Nashville	New Jersey	NELAC	2	TN965
TestAmerica Nashville	New York	NELAC	2	11342
TestAmerica Nashville	North Carolina DENR	State Program	4	387
TestAmerica Nashville	North Dakota	State Program	8	R-146
TestAmerica Nashville	Ohio VAP	State Program	5	CL0033
TestAmerica Nashville	Oklahoma	State Program	6	9412
TestAmerica Nashville	Oregon	NELAC	10	TN200001
TestAmerica Nashville	Pennsylvania	NELAC	3	68-00585
TestAmerica Nashville	Rhode Island	State Program	1	LAO00268
TestAmerica Nashville	South Carolina	State Program	4	84009 (001)
TestAmerica Nashville	South Carolina	State Program	4	84009 (002)
TestAmerica Nashville	Tennessee	State Program	4	2008
TestAmerica Nashville	Texas	NELAC	6	T104704077-09-TX
TestAmerica Nashville	USDA	Federal		S-48469
TestAmerica Nashville	Utah	NELAC	8	TAN
TestAmerica Nashville	Virginia	NELAC	3	460152
TestAmerica Nashville	Washington	State Program	10	C789
TestAmerica Nashville	West Virginia DEP	State Program	3	219
TestAmerica Nashville	Wisconsin	State Program	5	998020430
TestAmerica Nashville	Wyoming (UST)	A2LA	8	453.07

Accreditation may not be offered or required for all methods and analytes reported in this package Please contact your project manager for the laboratory's current list of certified methods and analytes.



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**APPENDIX C**

**RECONSTRUCTED MONITORING WELL ELEVATIONS**

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 10

1200 SIXTH AVENUE

SEATTLE, WA 98101

**TARGET SHEET**

**The following document was not imaged.**

This is due to the Original being:

  X   Oversized

       CD Rom

       Computer Disk

       Video Tape

       Other:

\*\*A copy of the document may be requested from the Superfund Records Center.

**\*Document Information\***

Document ID #: 1429435

File #: FHCSF 19.4.1.2 v. 2

Site Name: Frontier Hard Chrome

Monitoring Well Asbuilt for Grand Central



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**APPENDIX D**  
**DATA VALIDATION MEMORANDUM**



## APPENDIX D EXCEPTION SUMMARY FOR LABORATORY DATA QUALITY ASSURANCE REVIEW

### DATA SUMMARY

The laboratory data quality assurance review and validation of analytical results for 26 water samples, Project Number 1210057, collected between October 15 and 18, 2012 from the Frontier Hard Chrome site has been completed. This review incorporates sample results for other metals for assessment purposes, but applies only to the following analyses:

- Total and dissolved chromium by Washington State Department of Ecology's (Ecology) Manchester Environmental Laboratory (MEL), of Port Orchard, Washington, following EPA Method 200.7 – inductively-coupled plasma/atomic emission spectrometry (ICP-AES).
- Sulfate by Ecology's MEL of Port Orchard, Washington, following EPA Method 300.0 – determination of inorganic anions by ion chromatography.
- Dissolved sulfur by TestAmerica Laboratories, Inc. - Seattle of Tacoma, Washington, following EPA Method 200.7 – inductively-coupled plasma/atomic emission spectrometry (ICP-AES).
- Hexavalent chromium by Columbia Analytical Services, Inc. (CAS) [doing business as ALS Environmental (ALS)] of Kelso, Washington, following EPA SW-846 Method 7196A –colorimetry.

Quality assurance/quality control (QA/QC) reviews of laboratory procedures were performed on an ongoing basis by MEL. A data review was performed by MEL's QA section on laboratory quality control results to ensure they met method quality objectives for the project. Data review followed the format outlined in the *National Functional Guidelines for Inorganic Data Review* (EPA 2004), modified to include specific criteria specified in the *Frontier Hard Chrome Long-Term Monitoring Plan* (Work Plan; Weston 2004). Raw laboratory data including calibrations, sample login forms, sample preparation logs and bench sheets, mass spectral tuning data, and raw instrument data were not available for this review.

This is an exception summary. All laboratory quality assurance results as applicable (e.g., holding times; blank sample analysis, matrix spike/duplicate spike analysis, and laboratory control sample analysis results) supplied to WESTON for the analyses met acceptance criteria specified in the Work Plan (Weston 2004), with no exceptions.

A field duplicate was not collected for hexavalent chromium analysis. Laboratory duplicate, matrix spike/duplicate spike analysis, and laboratory control sample analysis results met acceptance criteria.

Precision was evaluated as relative percent differences (RPD) between duplicate and total chromium, dissolved chromium concentrations and sulfate concentrations. Field duplicates for

total recoverable chromium (Sample Nos. 1210057-12, 1210057-20, and 1210057-26) were collected from monitoring wells B85-4, RA-MW-15B, and RA-MW-12A, respectively. A field duplicate for dissolved chromium (Sample No. 1210057-20) was collected from monitoring well RA-MW-15B. A field duplicate for sulfate (Sample No. 1210057-04) was collected from monitoring well W85-6A. Acceptance criteria specified in the QAPP were met for all duplicate analyses.

Sample 1210057-19 (collected from monitoring well RA-MW-15B) and its associated duplicate sample, 1210057-20 (QA-3) both exhibited total and dissolved chromium concentrations below their respective laboratory detection limits; therefore, the RPD between the field sample and the duplicate sample was not calculable for either total or dissolved chromium. Additionally, sample 1210057-11 (collected from monitoring well B85-4) and its associated duplicate sample, 1210057-12 (QA-2), both exhibited total chromium concentrations below their respective laboratory detection limits; therefore, the RPD between the field sample and the duplicate sample was not calculable. The RPD for total chromium between sample 1210057-25 (collected from RA-MW-12A) and its duplicate sample, 1210057-26 (QA-4), was calculated as 16.9%. The RPD for sulfate between sample 1210057-03 (collected from W85-6A) and its duplicate sample, 1210057-04 (QA-1), was calculated as 0.5%.

## **DATA QUALIFICATION**

No QA/QC exceptions were noted in the data review associated with the analysis of total recoverable, dissolved, and hexavalent chromium. Upon consideration of the data qualifications noted above and the project data quality objectives specified in the QAPP, the data are ACCEPTABLE for use.

## **DATA QUALIFIERS**

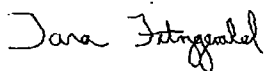
**If required, any data qualifiers applied by the laboratory have been removed from the data summary sheets and superseded by data validation qualifiers.**

No data validation qualifiers were used to modify the data quality and usefulness of individual analytical results.

## **DATA ASSESSMENT**

Data review was performed by an experienced quality assurance chemist independent of the analytical laboratory and not directly involved in the project.

This is to certify that I have examined the analytical data and based on the information provided to me by the laboratory, in my professional judgment the data are acceptable for use except where qualified with qualifiers that modify the usefulness of those individual values.



Tara Fitzgerald  
Project Chemist

December 21, 2012

Date



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**APPENDIX E**

**MONITORING WELL CONSTRUCTION AND FIELD DATA SHEETS**



**Monitoring Well Construction Information**  
**Frontier Hard Chrome, Vancouver, Washington**

Well No.	Well Dia. (in)	Well Depth (feet)	Top of Screen Depth (ft)	Bottom of Screen Depth (ft)	Screen Length (ft)	Date Installed	Northing	Easting	Casing Elev. (feet)*	Top of Monument Elev. (feet)*
Monitoring Wells										
B85-3	2	29.5	24	29	5	10/7/85	112605.90	1091462.16	24.9	25.6 <sup>+</sup>
B85-4	2	26.5	21.5	26.5	5	10/10/85	112324.18	1091631.89	25.38	26.18
B85-6	2	29.5	24.5	29.5	5	10/15/85	112532.34	1091705.95	24.64	25.2 <sup>+</sup>
B87-8	4	29.5	24.5	29.5	5	1/13/87	112344.00	1091529.10	25.95	26.21
MW-1	2	34.5	19.2	34.0	14.8	5/21/02	112441.82	1091607.30	25.69	26.00
MW-3	2	37.3	21.7	36.5	14.8	5/20/02	112433.24	1091610.54	25.69	26.04
MW-4	2	35.2	19.7	34.5	14.8	5/22/02	112424.34	1091616.25	25.62	25.84
MW-7	2	47.2	41.6	46.4	4.8	5/20/02	112442.22	1091620.89	25.66	25.93
MW-20	2	27.3	21.9	26.6	4.7	5/22/02	112462.35	1091613.99	25.75	26.09
MW-21	2	35.6	30.4	35.1	4.7	5/22/02	112462.58	1091617.43	25.77	26.14
RA-MW-11A	2	27.8	22.9	27.6	4.7	5/2/03	112482.47	1091514.95	26.17	26.45
RA-MW-11B	2	33.1	28.3	32.9	4.6	5/1/03	112479.76	1091510.42	26.17	26.45
RA-MW-12A	2	28.1	23.2	27.9	4.7	5/1/03	112479.92	1091544.46	26.17	26.47
RA-MW-12B	2	33.0	28.3	32.8	4.5	5/1/03	112480.85	1091541.13	26.16	26.53
RA-MW-12C	2	39.2	34.5	39.0	4.5	4/30/03	112484.97	1091542.35	26.01	26.48
RA-MW-13A	2	27.3	22.5	27.1	4.6	6/3/03	112449.48	1091594.97	25.69	25.96
RA-MW-13B	2	32.1	27.3	31.9	4.6	6/3/03	112448.39	1091592.13	25.61	25.86
RA-MW-13C	2	39.7	34.6	39.5	4.9	6/3/03	112453.33	1091595.78	25.55	25.97
RA-MW-14A	2	25.3	20.3	25.1	4.8	6/4/03	112447.10	1091654.85	25.06	25.44
RA-MW-14B	2	30.3	25.5	30.1	4.6	6/4/03	112444.72	1091652.41	25.00	25.38
RA-MW-15A	2	26.6	22.1	26.6	4.5	5/30/03	112412.99	1091561.36	25.76	26.11
RA-MW-15B	2	32.7	27.7	32.5	4.8	5/30/03	112413.29	1091557.10	25.79	26.10
RA-MW-16A	2	26.8	22.2	26.7	4.5	6/2/03	112413.87	1091630.20	25.14	25.47
RA-MW-16B	2	32.7	27.9	32.5	4.6	6/2/03	112414.70	1091626.50	25.45	25.68
RA-MW-17A	2	26.4	21.7	26.2	4.5	6/5/03	112478.04	1091624.86	25.96	26.23
W85-2B	4	50	45	49	5	9/10/85	112427.94	1091417.06	25.77	26.09
W85-3A	2	29.5	19.5	29.5	10	9/5/85	112824.50	1091509.69	26.40	26.97
W85-3B	4	49	44	49	5	9/4/85	112824.23	1091514.26	26.77	27.14
W85-6A <sup>#</sup>	2	27	17	27	10	10/12/85	111924.04	1091489.91	25.38	25.8 <sup>+</sup>
W85-6B <sup>#</sup>	4	49	44	49	5	10/11/85	111912.90	1091495.31	25.24	25.8 <sup>+</sup>
W85-7A <sup>#</sup>	2	26.5	16.5	26.5	10	10/22/85	111916.01	1090984.92	22.83	23.1 <sup>+</sup>
W85-7B <sup>#</sup>	2	49	44	49	5	10/21/85	111917.15	1090952.50	23.0	23.1 <sup>+</sup>
W86-10B	4	50	43.8	48.8	5	12/12/86	112510.41	1093365.77	26.8	26.6 <sup>+</sup>
W86-13A	4	28.5	23.5	28.5	5	12/16/86	112712.34	1090490.94	26.39	26.7 <sup>+</sup>
W92-16A	4	34	24	34	10	6/23/92	112438.05	1091446.66	25.62	25.98
W92-16B	4	45	35	45	10	6/23/92	112424.30	1091445.85	25.51	25.87

**Monitoring Well Construction Information  
Frontier Hard Chrome, Vancouver, Washington**

Well No.	Well Dia. (in)	Well Depth (feet)	Top of Screen Depth (ft)	Bottom of Screen Depth (ft)	Screen Length (ft)	Date Installed	Northing	Easting	Casing Elev. (feet)*	Top of Monument Elev. (feet)*
W97-18A	2	27.5	22.5	27.5	5	2/27/97	112299.62	1091919.98	25.44	25.72
W97-18B	2	44.5	39.5	44.5	5	2/26/97	112299.13	1091926.64	25.36	25.73
W97-19A <sup>#</sup>	2	25	20	25	5	3/17/97	111767.46	1090360.19	22.45**	22.99**
W97-19B <sup>#</sup>	2	45	40	45	5	3/17/97	111758.69	1090357.80	21.72**	22.56**
W98-20A <sup>#</sup>	2	27	22	27	5	5/29/98	111631.28	1090944.00	23.57**	23.87**
W98-21A <sup>#</sup>	2	26	21	26	5	5/27/98	111623.54	1091536.07	25.28**	25.5**
W98-21B <sup>#</sup>	2	44	39	44	5	5/28/98	111616.84	1091543.41	25.5**	25.77**
W99-R5A	2	32.2	22	32	10	1999	110927.24	1089741.49	32.26	NA
W99-R5B	2	49	44	49	5	1999	110929.99	1089743.59	32.33	NA

Notes:

\* Feet above mean sea level. Vertical datum - City of Vancouver benchmark number 108.

\*\* Corrected to common datum. See Section 2.1.3 for explanation.

+ Ground surface elevation.

# Northings and eastings obtained from conversion from GPS latitude and longitude taken February 2, 2004; GPS measurements and conversion done by EPA



# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: W97-19A  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-01  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/15/12 14:45 Weather: ~60°F; rainy

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>14:45</u>	<u>25</u>	<u>17.84</u>	<u>7.16</u>	<u>1.17(x3 = 3.50)</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 14:45 Total Volume Purged: ~3 gal.

End Purge: Time: 15:50 Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 15:50

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear; no odor; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Total Chromium; pH ≈ 1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes: pump from 23' bgs

Sampler Signature: [Signature]



Date: 10/15/12Well ID: W97-19A**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
14:45	17.84		13.84	258	3.10	6.63	92.4	0.63
14:50	17.84		13.84	255	3.19	6.44	101.3	0.49
14:55	17.84		13.92	253	3.08	6.45	103.5	0.49
15:00	17.84		13.92	253	3.04	6.47	101.0	0.39
15:05	17.84		13.94	251	3.06	6.50	104.3	0.28
15:10	17.84		13.90	251	3.03	6.51	103.9	0.28
15:15	17.84		13.96	251	2.99	6.52	104.3	0.30
15:20	17.84		14.00	250	2.96	6.54	105.5	0.29
15:25	17.84		14.02	250	2.94	6.54	107.3	0.27
15:30	17.84		14.04	250	2.90	6.54	109.9	0.32
15:35	17.84		14.04	249	2.89	6.54	111.3	0.58
15:40	17.84		14.08	249	2.99	6.55	110.3	0.56
15:45	17.84		14.11	249	2.85	6.55	111.8	0.27

Notes :





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: W97-AB  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-02  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/15/12 15:55 Weather: ~60°F; rainy

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
	<u>45</u>	<u>17.16</u>	<u>27.84</u>	<u>4.54</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<input type="checkbox"/> Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 16:00

Total Volume Purged: ~3 gal.

End Purge: Time: 17:00

Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:

5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 17:05

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear; no odor; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Total Chromium; pH?</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes: pump from 27' bgs

Sampler Signature: [Signature]

Date: 10/15/12Well ID: WAT-19B**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
1600 <sup>*1</sup>	17.16	0	14.32	249	<del>2.75</del> 44.102	6.57	112.1	1.21
1605 <sup>*1</sup>	17.16		14.32	249	2.75	6.57	112.1	0.25
1610	17.16		14.02	256	2.91	6.67	105.9	0.23
1615	17.16		13.97	256	3.00	6.67	117.4	0.40
1620	17.16		13.97	255	2.95	6.67	119.3	0.23
1625	17.16		13.97	255	2.92	6.67	121.3	0.41
1630	17.16		13.98	255	2.89	6.68	121.4	0.45
1635	17.16		14.00	255	2.89	6.68	122.2	0.55
1640	17.16		13.90	255	2.88	6.68	122.7	0.68
1645	17.16		13.92	255	2.86	6.68	123.9	0.69
1650	17.14		13.98	255	2.83	6.69	124.9	0.73
1655	17.16		14.00	255	2.82	6.69	125.1	0.67
1700	17.16		14.01	255	2.80	6.70	126.0	0.37

**Notes :**

\*1 - YSI seems to have been malfunctioning & stuck for first 2 readings, reset unit



# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: WRS-6A  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-03 [-04 = QA-1]  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/16/12 0745 Weather: light showers → pretty cloudy ~50%

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>0755</u>	<u>27.00</u>	<u>20.99</u>	<u>6.01</u>	<u>0.98</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<input type="checkbox"/> Meas. <input type="checkbox"/> Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailor ☐ Other:

Purge Rate: ~ 200 mL/min

Begin Purge: Time: 0800

Total Volume Purged: ~ 3 gal

End Purge: Time: 0900

Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:

5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 0910

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailor ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear; no odor; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Total Chromium; pH = 1</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Sulfate</u>
<u>① 1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Dissolved Sulfur; pH = 1</u>
<u>QA-1</u>		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Sulfate; Time = 0915</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes: pump from 25' bags

① filtered

Sampler Signature:

Date: 10/16/12Well ID: W85-6A**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
<del>0800</del>	20.99	<del>φ</del>	14.17	270	5.24	6.50	92.5	0.14
0805	20.99		14.14	270	5.15	6.42	96.8	0.26
0810	20.99		14.01	269	4.89	6.38	98.6	0.14
① 0815	20.99							
0820	20.99		14.17	265	4.53	6.49	100.9	0.21
0825	20.99		14.17	261	4.70	6.51	102.2	0.17
0830	20.99		14.16	258	5.14	6.51	101.6	0.20
0835	20.99		14.16	252	5.28	6.53	101.4	0.19
0840	20.99		14.18	251	5.08	6.53	101.1	0.15
0845	20.99		14.20	246	5.10	6.53	99.9	0.14
0850	20.99		14.22	258	5.11	6.54	99.8	0.18
0855	20.99		14.24	253	5.08	6.54	100.2	0.18
0900	20.99		14.26	249	5.07	6.54	100.8	0.14

**Notes:**

① Flow rate severely decreased. Increased pump speed to compensate





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: W85-6B  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-05  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/16/12 0910 Weather: partly cloudy; ~50°C

## Water Level Measurements and Purge Data

Time	Depth-of-Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>0915</u>	<u>49</u>	<u>20.91</u>	<u>28.09</u>	<u>4.58</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailor ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 0915

Total Volume Purged: ~3 gal.

End Purge: Time: 1025

Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1030

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailor ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear; no odor; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Total Chromium; pH=1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes: -pump from 21' bgs

Sampler Signature: [Signature]

Date: 10/16/12Well ID: W85-6B**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
0920	20.91		<del>14.31</del>	<del>246</del>	<del>4.04</del>	<del>6.56</del>	<del>104.9</del>	0.24
0925	20.91		<del>14.31</del>	<del>246</del>	<del>4.04</del>	<del>6.56</del>	<del>104.9</del>	0.11
① 0930	20.91		<del>14.31</del>					0.11 <sup>OK</sup>
0935	20.91		14.23	221	9.43	7.63	87.7	0.10
0940	20.91		14.23	221	9.40	7.66	91.6	0.12
0945	20.91		14.23	221	9.38	7.66	94.8	0.16
② 0950	20.91		14.29	221	9.37	7.67	95.8	0.14
③ 0955	20.91		14.13	219	10.08	7.64	99.0	0.18
1000	20.91		14.25	217	11.05	7.67	98.8	0.16
1005	20.91		14.27	216	10.89	7.67	100.7	0.14
1010	20.91		14.19	213	11.63	7.66	103.0	0.23
1015	20.91		14.26	212	11.03	7.66	104.1	0.18
1020	20.91		14.30	214	11.06	7.67	104.7	0.30
1025	20.91		14.20	217	10.86	7.65	107.0	0.24

**Notes:**

- ① Had to reset YSI, values frozen after unplugging while on. Values till 0935 not accurate.
- ② Severe decrease in flow rate. Increased pump speed to compensate.
- ③ flow rate becoming variable; unsure why, try to compensate w/ pump; also notable jump in DO.



# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: WPP-25A  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-06  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/16/12 1105 Weather: partly cloudy; ~55°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1110</u>	<u>32.2</u> <input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<u>27.42</u> Initial	<u>4.78</u>	<u>0.78</u>

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailor ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 1110 Total Volume Purged: ~3 gal

End Purge: Time: 1210 Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1215

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailor ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.):

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH ≈ 1</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Sulfate</u>
<u>① 1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>D. Sulfur; pH ≈ 1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

## Notes:

- pump from 27' bgs  
① filtered

Sampler Signature: [Signature]



Date: 10/16/12Well ID: W99-R5A**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
<u>1110</u>	<u>27.42</u>	<u>∅</u>	<u>14.24</u>	<u>247</u>	<u>5.20</u>	<u>6.44</u>	<u>128.6</u>	<u>0.63</u>
<u>1115</u>	<u>27.42</u>		<u>14.30</u>	<u>247</u>	<u>4.86</u>	<u>6.38</u>	<u>133.3</u>	<u>0.97</u>
① <u>1120</u>	<u>27.42</u>		<u>14.95</u>	<u>245</u>	<u>4.71</u>	<u>6.43</u>	<u>133.1</u>	<u>0.93</u>
<u>1125</u>	<u>27.42</u>		<u>14.49</u>	<u>246</u>	<u>4.56</u>	<u>6.40</u>	<u>136.1</u>	<u>1.25</u>
<u>1130</u>	<u>27.42</u>		<u>14.30</u>	<u>246</u>	<u>4.44</u>	<u>6.36</u>	<u>140.7</u>	<u>1.01</u>
<u>1135</u>	<u>27.42</u>		<u>14.38</u>	<u>246</u>	<u>4.41</u>	<u>6.38</u>	<u>140.8</u>	<u>0.91</u>
<u>1140</u>	<u>27.42</u>		<u>14.30</u>	<u>246</u>	<u>4.39</u>	<u>6.38</u>	<u>141.6</u>	<u>0.54</u>
<u>1145</u>	<u>27.42</u>		<u>14.17</u>	<u>246</u>	<u>4.38</u>	<u>6.37</u>	<u>142.6</u>	<u>0.41</u>
<u>1150</u>	<u>27.42</u>		<u>14.15</u>	<u>246</u>	<u>4.38</u>	<u>6.37</u>	<u>142.1</u>	<u>0.36</u>
<u>1155</u>	<u>27.42</u>		<u>14.10</u>	<u>246</u>	<u>4.37</u>	<u>6.39</u>	<u>140.5</u>	<u>0.71</u>
<u>1200</u>	<u>27.42</u>		<u>14.10</u>	<u>246</u>	<u>4.36</u>	<u>6.39</u>	<u>140.8</u>	<u>0.21</u>
<u>1205</u>	<u>27.42</u>		<u>14.08</u>	<u>246</u>	<u>4.36</u>	<u>6.39</u>	<u>140.9</u>	<u>0.23</u>
② <u>1210</u>	<u>27.42</u>		<u>14.08</u>	<u>246</u>	<u>4.38</u>	<u>6.40</u>	<u>140.4</u>	<u>clear</u>

**Notes:**

① flow rate varying. Try to compensate w/ pump.

② L. Lo error on turbidimeter, could not get final reading.





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: W99-25B  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-07  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/16/12 1225 Weather: partly cloudy ~ 60°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1225</u>	<u>49.00</u>	<u>27.46</u>	<u>21.54</u>	<u>3.51</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<input type="checkbox"/> Meas. <input type="checkbox"/> Hist.	<input type="checkbox"/> Meas. <input type="checkbox"/> Hist.	

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 1230 Total Volume Purged: ~3 gal

End Purge: Time: 1320 Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1325

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.):

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH ~ 1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes:

Sampler Signature: [Signature]





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: W98-21B  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-08  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/16/12 1430 Weather: partly cloudy; ~60°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1430</u>	<u>44</u>	<u>22.06</u>	<u>21.94</u>	<u>3.58</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<input type="checkbox"/> Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailor ☐ Other:

Purge Rate: ~200 ml/min

Begin Purge: Time: 1435

Total Volume Purged: ~3 gal.

End Purge: Time: 1535

Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1540

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated: ☒ Y ☐ N ☐ Bailor ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear, no odor, no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH = 1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes: pump from 27' bgs

Sampler Signature: 



Date: 10/16/12Well ID: W98-213**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
1435	22.06	0	14.55	230	8.77	6.75	122.1	0.14
1440	22.06		14.03	224	7.99	6.33	149.3	0.13
1445	22.06		13.87	223	7.89	6.33	157.8	0.23
1450	22.06		13.82	222	7.77	6.32	158.9	0.31
1455	22.06		13.76	222	8.05	6.32	160.6	0.29
① 1500	22.06		13.87	224	7.74	6.33	161.1	0.24
1505	22.06		13.94	225	7.66	6.36	160.4	0.38
1510	22.06		14.00	253	7.27	6.40	160.6	0.27
1515	22.06		13.91	274	6.67	6.45	159.6	0.14
1520	22.06		13.78	277	5.91	6.48	158.2	0.21
1525	22.06		13.73	276	5.43	6.48	157.1	0.14
1530	22.06		13.72	274	5.18	6.49	156.6	0.30
1535	22.06		13.69	274	4.92	6.49	155.8	0.16

**Notes :**

① purge rate decreased, increased pump flow to compensate





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: W98-21A  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057 09  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/16/12 1545 Weather: overcast, ~65°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1545</u>	<u>26</u>	<u>21.84</u>	<u>4.16</u>	<u>0.68</u>
<input type="checkbox"/> Meas.	<input checked="" type="checkbox"/> Hist.	Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 1545 Total Volume Purged: ~3 gal.

End Purge: Time: 1640 Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1645

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear; no odor; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH ~ 1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes: - pump from 24' bgs

Sampler Signature: [Signature]

Date: 10/16/12Well ID: W98-21A**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
<u>1545</u>	<u>21.84</u>	<u>φ</u>	<u>14.05</u>	<u>262</u>	<u>5.46</u>	<u>6.45</u>	<u>143.2</u>	<u>0.20</u>
<u>1550</u>	<u>21.84</u>		<u>13.99</u>	<u>258</u>	<u>4.53</u>	<u>6.41</u>	<u>151.4</u>	<u>0.34</u>
<u>1555</u>	<u>21.84</u>		<u>13.99</u>	<u>257</u>	<u>4.44</u>	<u>6.41</u>	<u>151.3</u>	<u>0.63</u>
<u>1600</u>	<u>21.84</u>		<u>13.98</u>	<u>257</u>	<u>4.32</u>	<u>6.40</u>	<u>151.6</u>	<u>0.49</u>
<u>1605</u>	<u>21.84</u>		<u>13.96</u>	<u>256</u>	<u>4.29</u>	<u>6.40</u>	<u>151.5</u>	<u>0.57</u>
<u>1610</u>	<u>21.84</u>		<u>13.97</u>	<u>256</u>	<u>4.29</u>	<u>6.40</u>	<u>149.6</u>	<u>0.50</u>
<u>1615</u>	<u>21.84</u>		<u>13.95</u>	<u>256</u>	<u>4.32</u>	<u>6.39</u>	<u>148.1</u>	<u>0.38</u>
<u>1620</u>	<u>21.84</u>		<u>14.00</u>	<u>255</u>	<u>4.45</u>	<u>6.39</u>	<u>147.7</u>	<u>0.41</u>
<u>① 1625</u>	<u>21.84</u>		<u>14.20</u>	<u>252</u>	<u>4.62</u>	<u>6.36</u>	<u>148.8</u>	<u>0.44</u>
<u>1630</u>	<u>21.84</u>		<u>14.03</u>	<u>252</u>	<u>4.55</u>	<u>6.32</u>	<u>152.0</u>	<u>0.33</u>
<u>1635</u>	<u>21.84</u>		<u>14.15</u>	<u>252</u>	<u>4.54</u>	<u>6.35</u>	<u>152.4</u>	<u>0.15</u>
<u>1640</u>	<u>21.84</u>		<u>14.13</u>	<u>253</u>	<u>4.53</u>	<u>6.34</u>	<u>154.7</u>	<u>0.23</u>

**Notes:**

① flow rate dropped; adjusted pump speed to compensate



# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: B85-3  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 121005T-10  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/16/12 1705 Weather: overcast, some showers

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1705</u>	<u>29.5</u>	<u>19.91</u>	<u>9.59</u>	<u>1.56</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~ 200 mL/min

Begin Purge: Time: 1710 Total Volume Purged: ~ 3 gal

End Purge: Time: 1810 Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1815

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear, no odor, no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium, pH 2.1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

## Notes:

pump from 25' bgs (slightly higher than typical due to TOC being recovered below ground)

Sampler Signature: [Signature]



Date: 10/16/12Well ID: B85-3**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (μS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
<u>1710</u>	<u>19.91</u>	<u>∅</u>	<u>12.96</u>	<u>801</u>	<u>2.27</u>	<u>6.79</u>	<u>-64.0</u>	<u>79.2</u>
<u>1715</u>	<u>19.96</u>	<u>    </u>	<u>12.77</u>	<u>820</u>	<u>1.26</u>	<u>6.77</u>	<u>-50.7</u>	<u>16.8</u>
<u>1720</u>	<u>19.96</u>	<u>    </u>	<u>12.71</u>	<u>827</u>	<u>0.95</u>	<u>6.78</u>	<u>-53.5</u>	<u>6.74</u>
<u>1725</u>	<u>19.96</u>	<u>    </u>	<u>12.70</u>	<u>836</u>	<u>0.63</u>	<u>6.80</u>	<u>-52.9</u>	<u>3.58</u>
<u>1730</u>	<u>19.96</u>	<u>    </u>	<u>12.68</u>	<u>848</u>	<u>0.50</u>	<u>6.80</u>	<u>-52.8</u>	<u>3.86</u>
<u>1735</u>	<u>19.96</u>	<u>    </u>	<u>12.64</u>	<u>856</u>	<u>0.43</u>	<u>6.81</u>	<u>-57.4</u>	<u>1.44</u>
<u>1740</u>	<u>19.96</u>	<u>    </u>	<u>12.63</u>	<u>863</u>	<u>0.39</u>	<u>6.81</u>	<u>-57.0</u>	<u>1.00</u>
<u>1745</u>	<u>19.96</u>	<u>    </u>	<u>12.61</u>	<u>872</u>	<u>0.35</u>	<u>6.81</u>	<u>-62.0</u>	<u>1.17</u>
<u>1750</u>	<u>19.96</u>	<u>    </u>	<u>12.67</u>	<u>876</u>	<u>0.33</u>	<u>6.81</u>	<u>-61.7</u>	<u>0.57</u>
<u>1755</u>	<u>19.96</u>	<u>    </u>	<u>12.56</u>	<u>876</u>	<u>0.31</u>	<u>6.82</u>	<u>-59.3</u>	<u>1.00</u>
<u>1800</u>	<u>19.96</u>	<u>    </u>	<u>12.55</u>	<u>876</u>	<u>0.30</u>	<u>6.81</u>	<u>-58.7</u>	<u>0.69</u>
<u>1805</u>	<u>19.96</u>	<u>    </u>	<u>12.54</u>	<u>876</u>	<u>0.29</u>	<u>6.82</u>	<u>-55.4</u>	<u>0.64</u>
<u>1810</u>	<u>19.96</u>	<u>    </u>	<u>12.54</u>	<u>875</u>	<u>0.28</u>	<u>6.82</u>	<u>-58.1</u>	<u>0.74</u>
<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>
<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>	<u>    </u>

Notes :





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: 385-4  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-11 (1210057-12 = QA-2)  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/17/12 0740 Weather: overcast; ~45°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>0740</u>	<u>26.5</u>	<u>19.98</u>	<u>6.52</u>	<u>1.06</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 0745 Total Volume Purged: ~3 gal.

End Purge: Time: 0845 Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 0850

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear; no odor; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH ≈ 1</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Sulfate</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>D. Sulfur; pH ≈ 1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH ≈ 1</u>

## Notes:

= pump from 24' bgs

QA-2 time = 0855

Sampler Signature: [Signature]



Date: 10/17/12Well ID: B85-4**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
0745	19.98	0	13.44	424	2.60	7.12	70.9	1.71
0750	19.98		13.27	416	1.14	6.82	94.6	1.02
0755	19.98		13.13	410	0.68	6.73	112.0	0.55
0800	19.98		13.18	409	0.54	6.72	116.4	1.13
0805	19.98		13.18	409	0.49	6.75	117.7	0.47
0810	19.98		13.20	409	0.44	6.77	117.7	0.20
0815	19.98		13.21	410	0.40	6.78	118.1	0.31
0820	19.98		13.17	412	0.36	6.77	118.3	0.43
0825	19.98		13.18	412	0.35	6.78	118.0	0.43
0830	19.98		13.21	414	0.35	6.79	119.1	0.36
0835	19.98		13.19	414	0.34	6.79	119.2	0.39
0840	19.98		13.17	415	0.33	6.79	119.6	0.11
0845	19.98		13.19	416	0.38	6.77	119.1	0.21

Notes :



# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: B87-8  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210657-13  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 12/17/12 0910 Weather: fog/clouds ; ~50°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>0910</u>	<u>29.5</u>	<u>24.108</u>	<u>4.82</u>	<u>3.15</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<input type="checkbox"/> Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailor ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 0925

Total Volume Purged: ~3 gal

End Purge: Time: 1025

Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1030

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailor ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear, slight sulfur odor, no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH 2</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>D. Chromium; pH 2</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Chromium (VI); unpres.</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>Sulfate</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>D. Sulfur; pH 2</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

### Notes:

- ① filtered - pump from 27' bgs
- ② had difficulty getting tubing down well, attached weight and next day have stirred H<sub>2</sub>O and level noted acting inconsistent, so Depth to Water is estimate only.

Sampler Signature: [Signature]

Date: 10/17/12Well ID: B87-8**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
0925	24.68	Ø	13.26	101	6.92	6.62	91.1	158
0930	24.68		13.30	128	4.52	6.64	56.6	130
0935	24.68		13.32	146	3.38	6.65	48.3	115
0940	24.68		13.34	168	2.91	6.67	40.2	102
0945	24.68		13.38	197	2.43	6.71	28.7	97.0
0950	24.68		13.43	250	2.10	6.73	13.9	46.0
0955	24.68		13.38	300	1.26	6.75	-2.8	26.5
1000	24.68		13.38	340	0.86	6.77	-12.8	16.7
1005	24.68		13.38	364	0.68	6.78	-16.5	10.4
1010	24.68		13.38	375	0.52	6.79	-16.8	9.43
1015	24.68		13.32	384	0.48	6.79	-16.3	9.16
1020	24.68		13.28	392	0.46	6.79	-16.7	8.36
1025	24.68		13.29	394	0.42	6.79	-16.5	7.47

Notes :





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: W97-18A  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-14  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/17/12 1130 Weather: partly cloudy; ~55°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1135</u>	<u>27.5</u>	<u>19.54</u>	<u>7.96</u>	<u>1.30</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 1140 Total Volume Purged: ~3 gal

End Purge: Time: 1235 Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1240

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear, no odor; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH=1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes: -pump from 25' bgs

Sampler Signature: [Signature]

Date: 10/17/12Well ID: W97-18A**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
1140	19.54	0	13.74	175	3.11	6.42	115.0	1.65
1145	19.54		13.74	175	1.91	6.27	133.9	0.90
1150	19.54		13.78	173	1.32	6.26	140.8	0.66
1155	19.54		13.84	173	1.25	6.27	143.7	0.62
1200	19.54		13.75	173	1.17	6.25	145.6	0.43
1205	19.54		13.71	172	1.16	6.25	148.2	0.40
1210	19.54		13.87	172	1.11	6.27	147.2	0.39
1215	19.54		13.76	172	1.09	6.26	149.5	0.37
1220	19.54		13.77	172	1.06	6.25	149.4	0.39
1225	19.54		13.77	173	1.03	6.25	148.3	0.42
1230	19.54		13.78	173	1.01	6.26	149.4	0.39
1235	19.54		13.75	173	1.00	6.25	150.4	0.37

Notes:



# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: RA-MW-17A  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-15  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/17/12 1320 Weather: mostly sunny, ~60°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1320</u>	<u>26.4</u> <input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<u>20.88</u> Initial	<u>5.52</u>	<u>0.90</u>

Water Level Measurement Method: ☒ Electric Tape ☐ Other: \_\_\_\_\_

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other: \_\_\_\_\_

Purge Rate: ~200 mL/min

Begin Purge: Time: 1330 Total Volume Purged: ~3 gal

End Purge: Time: 1425 Well Volumes Purged: \_\_\_\_\_

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other: \_\_\_\_\_

Sample Time: 1030<sup>5PM</sup> / 1430

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other: \_\_\_\_\_

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other: \_\_\_\_\_

Sample Description (color, turbidity, odor, sheen, etc.): clear; no odor; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH 3.1</u>
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____

## Notes:

pump from 24' bgs  
- no H<sub>2</sub>O in wellhead  
- moderate seal

Sampler Signature: [Signature]



Date: 10/17/12Well ID: RA-MW-17A**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
1330	20.88	Ø	13.09	1112	1.79	6.52	-18.5	6.13
1335	20.90		13.02	1123	0.92	6.56	-29.6	1.30
1340	20.90		13.01	1122	0.78	6.55	-30.7	0.69
1345	20.90		13.02	1113	0.72	6.55	-30.7	0.99
1350	20.90		13.02	1100	0.60	6.54	-32.3	0.43
1355	20.90		13.04	1092	0.56	6.54	-31.4	0.51
1400	20.90		13.02	1081	0.50	6.53	-32.9	0.78
1405	20.90		13.01	1076	0.49	6.53	-33.3	0.39
1410	20.90		13.02	1067	0.47	6.53	-33.4	0.72
1415	20.90		13.03	1063	0.45	6.53	-33.6	0.87
1420	20.90		13.05	1056	0.48	6.53	-35.9	0.86
1425	20.90		13.04	1052	0.37	6.52	-35.4	0.64

Notes :





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: W912-16A  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-16  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/17/12 1455 Weather: mostly sunny, ~65°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.183 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1455</u>	<u>34</u>	<u>20.56</u>	<u>13.44</u>	<u>8.78</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other: \_\_\_\_\_

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other: \_\_\_\_\_

Purge Rate: ~200 mL/min

Begin Purge: Time: 1500 Total Volume Purged: ~3 gal

End Purge: Time: 1555 Well Volumes Purged: \_\_\_\_\_

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other: \_\_\_\_\_

5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other: \_\_\_\_\_

Sample Time: 1600

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other: \_\_\_\_\_

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other: \_\_\_\_\_

Sample Description (color, turbidity, odor, sheen, etc.): clear, no odor, no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium, pH=1</u>
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____

Notes: -pump from 27' bgs

Sampler Signature: [Signature]

Date: 10/17/12Well ID: W92-16A**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
1500	20.56	<u>cb</u>	14.19	347	2.20	6.71	76.6	4.37
1505	20.56		14.31	345	1.46	6.65	83.3	1.86
1510	20.56		14.32	345	0.80	6.61	90.0	3.53
1515	20.56		14.29	344	0.50	6.59	94.3	1.72
1520	20.56		14.40	344	0.42	6.57	100.6	1.84
1525	20.56		13.90	344	0.38	6.56	104.4	1.06
1530	20.56		13.89	344	0.31	6.55	109.8	2.18
1535	20.56		13.87	343	0.29	6.57	110.3	2.11
1540	20.56		13.84	343	0.27	6.57	110.3	1.76
1545	20.56		13.84	343	0.26	6.58	110.2	2.13
1550	20.56		13.87	343	0.25	6.59	110.4	1.33
1555	20.56		13.88	343	0.24	6.60	111.3	1.33

Notes :



# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: W92-16B  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-17  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/17/12 1605 Weather: mostly sunny; ~65°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1605</u>	<u>45</u>	<u>20.45</u>	<u>24.55</u>	<u>16.03</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<input type="checkbox"/> Initial		

1705

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailor ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 1605

Total Volume Purged: ~3 gal

End Purge: Time:

Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1710

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailor ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear, no odor, no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH=1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes: pump from 27' bgs

Sampler Signature: [Signature]



Date: 10/17/12Well ID: W92-16B**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/ Turbidity
<u>1605</u>	<u>20.45</u>	<u>0</u>	<u>14.19</u>	<u>279</u>	<u>7.61</u>	<u>6.93</u>	<u>107.2</u>	<u>6.45</u>
<u>1610</u>	<u>20.48</u>		<u>13.68</u>	<u>273</u>	<u>8.87</u>	<u>6.88</u>	<u>142.4</u>	<u>1.56</u>
<u>1615</u>	<u>20.48</u>		<u>13.62</u>	<u>273</u>	<u>8.88</u>	<u>6.88</u>	<u>143.5</u>	<u>1.23</u>
<u>1620</u>	<u>20.48</u>		<u>13.59</u>	<u>273</u>	<u>8.89</u>	<u>6.89</u>	<u>144.6</u>	<u>0.88</u>
<u>1625</u>	<u>20.48</u>		<u>13.58</u>	<u>273</u>	<u>8.82</u>	<u>6.92</u>	<u>143.1</u>	<u>0.72</u>
<u>1630</u>	<u>20.48</u>		<u>13.54</u>	<u>273</u>	<u>8.42</u>	<u>6.92</u>	<u>141.8</u>	<u>0.69</u>
<u>1635</u>	<u>20.48</u>		<u>13.52</u>	<u>272</u>	<u>9.49</u>	<u>6.92</u>	<u>141.2</u>	<u>0.73</u>
<u>1640</u>	<u>20.48</u>		<u>13.79</u>	<u>272</u>	<u>8.80</u>	<u>6.94</u>	<u>140.4</u>	<u>0.56</u>
<u>1645</u>	<u>20.48</u>		<u>13.50</u>	<u>272</u>	<u>9.31</u>	<u>6.90</u>	<u>141.7</u>	<u>0.42</u>
<u>1650</u>	<u>20.48</u>		<u>13.49</u>	<u>271</u>	<u>9.24</u>	<u>6.93</u>	<u>139.1</u>	<u>0.50</u>
<u>1655</u>	<u>20.48</u>		<u>13.44</u>	<u>271</u>	<u>9.44</u>	<u>6.93</u>	<u>138.3</u>	<u>0.55</u>
<u>1700</u>	<u>20.48</u>		<u>13.43</u>	<u>271</u>	<u>9.18</u>	<u>6.93</u>	<u>138.0</u>	<u>0.84</u>
<u>1705</u>	<u>20.48</u>		<u>13.43</u>	<u>271</u>	<u>9.27</u>	<u>6.93</u>	<u>134.2</u>	<u>0.52</u>

Notes :





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: RA-MW-~~16~~A15A  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057 -18  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/18/12 0745 Weather: Foggy, ~50°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>0750</u>	<u>26.6</u> <input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<u>20.71</u> Initial	<u>5.89</u>	<u>0.96</u>

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 0800

Total Volume Purged: ~3 gal

End Purge: Time: 0855

Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:

5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 0900

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear, no odor, no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium, pH &gt; 1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes: pump from 24' bgs

Sampler Signature: [Signature]

Date: 10/18/12Well ID: PA-MW-15A**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
0800	20.71	0	13.28	1139	2.92	6.56	27.7	7.56
0805	20.71		13.26	1137	2.09	6.47	22.5	1.68
0810	20.71		13.19	1136	1.26	6.49	19.3	4.72
0815	20.71		13.16	1133	0.87	6.50	14.2	9.10
0820	20.71		13.13	1135	0.76	6.50	11.2	22.6
① 0825	20.71		13.07	1132	0.64	6.51	8.0	0.68
0830	20.71		13.10	1125	0.59	6.51	6.9	0.24
0835	20.71		13.10	1118	0.53	6.52	5.0	0.30
0840	20.71		13.06	1117	0.50	6.52	4.7	1.87
0845	20.71		13.08	1111	0.46	6.53	3.7	1.33
0850	20.71		13.13	1107	0.44	6.53	2.6	0.19
0855	20.71		13.14	1108	0.42	6.53	2.6	0.18

**Notes :**

- ① Received L Lo error on turbidimeter, re-ran w/ no error but much lower value; likely prev. msmts were not accurate.



# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: RA-MW-15B  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-19 (QA-3 = 1210057-20)  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/18/12 0900 Weather: partly cloudy, ~55°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>0900</u>	<u>32.7</u>	<u>20.69</u>	<u>12.01</u>	<u>1.96</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 0905

Total Volume Purged: ~3 gal

End Purge: Time: 1005

Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:

5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1010

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated: ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear, no odor, no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH 2.1</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>D. Chromium; pH 2.1</u>
<u>QA-3</u>		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH 2.1</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>D. Chromium; pH 2.1</u>

## Notes:

-pump from 27' bgs  
① filtered

time = 1015

Sampler Signature: [Signature]

Date: 10/18/12Well ID: RA-MW-15B**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
0905	20.69	Ø	13.17	384	5.29	7.07	17.7	0.87
0910	20.69		13.16	388	1.68	7.25	29.5	0.58
0915	20.69		13.16	388	1.23	7.26	31.3	0.38
0920	20.69		13.17	388	0.76	7.27	43.9	0.42
0925	20.69		13.19	388	0.59	7.27	47.4	0.80
0930	20.69		13.19	388	0.46	7.26	53.9	0.48
0935	20.69		13.28	388	0.58	7.25	56.1	0.57
0940	20.69		13.18	388	0.46	7.24	62.6	0.56
0945	20.69		13.18	388	0.41	7.24	64.6	0.40
0950	20.69		13.16	388	0.36	7.23	67.0	0.44
0955	20.69		13.24	389	0.21	7.24	66.9	0.26
1000	20.69		13.22	388	0.20	7.22	67.9	0.22
1005	20.69		13.23	388	0.19	7.23	67.0	0.31

Notes :





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: RA-MW-16A  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-21  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/18/12 1035 Weather: mostly sunny, ~60°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1035</u>	<u>26.8</u> <input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<u>19.79</u> Initial	<u>7.01</u>	<u>1.14</u>

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 ml/min

Begin Purge: Time: 1040 Total Volume Purged: ~3 gal

End Purge: Time: 1140 Well Volumes Purged: \_\_\_\_\_

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1145

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear, no odor, no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH 2.1</u>
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____

Notes: -pump from 24' bgs

Sampler Signature: [Signature]

Date: 10/18/12Well ID: PA-MW-16A**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
1040	19.79	∅	13.46	885	2.36	6.50	104.1	1.68
1045	20.55		13.47	894	1.87	6.51	102.3	1.13
1050	20.55		13.49	902	0.84	6.53	98.9	1.18
1055	20.55		13.43	910	0.76	6.52	84.1	1.23
1100	20.55		13.39	918	0.62	6.53	75.0	0.98
1105	20.55		13.52	922	0.56	6.52	68.8	0.56
1110	20.55		13.58	921	0.52	6.52	69.1	0.46
1115	20.55		13.49	924	0.51	6.51	69.8	0.37
1120	20.55		13.27	921	0.48	6.51	69.6	0.60
1125	20.55		13.26	919	0.46	6.52	67.8	0.35
1130	20.35		13.27	920	0.44	6.53	68.8	0.23
1135	20.35		13.32	920	0.42	6.53	67.1	0.53
1140	20.35		13.33	919	0.43	6.54	67.2	0.63

Notes :



# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: RA-MW-16B  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-22  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/18/12 1145 Weather: Sunny, ~65°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1145</u>	<u>32.7</u>	<u>20.32</u>	<u>12.38</u>	<u>2.02</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Initial		

Water-Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 1150 Total Volume Purged: \_\_\_\_\_

End Purge: Time: 1250 Well Volumes Purged: \_\_\_\_\_

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1255

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear; no odor; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH 2.1</u>
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____

Notes: -pump from 27' bgs

Sampler Signature: [Signature]



Date: 10/18/12Well ID: PA-MW-16B**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
1150	20.32	Ø	13.41	429	2.66	7.19	43.8	0.93
1155	20.38		13.44	889	0.56	6.72	103.7	1.32
1200	20.38		13.46	910	0.46	6.73	106.4	0.97
<sup>SPR</sup> <del>1210</del> 1205	20.38		13.51	927	0.35	6.74	110.1	0.60
<sup>SPR</sup> <del>1215</del> 1210	20.38		13.73	901	0.31	6.75	110.4	0.96
1215	20.38		13.74	881	0.26	6.76	110.7	1.02
1220	20.38		13.54	859	0.24	6.77	112.2	1.09
1225	20.38		13.54	847	0.22	6.78	113.7	0.94
<sup>①</sup> 1230	20.38		13.57	821	0.21	6.80	113.5	1.65
1235	20.38		13.67	807	0.21	6.81	112.4	0.38
1240	20.38		13.56	797	0.21	6.81	110.4	0.45
1245	20.38		13.55	783	0.20	6.82	106.1	0.36
1250	20.38		13.41	781	0.17	6.83	110.4	0.18

**Notes :**

① flow rate dropped; adjusted pump speed to compensate.





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: 2A-MW-2C  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-23  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/18/12 1320 Weather: partly cloudy; ~65°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1320</u> <sup>con</sup> <u>1325</u>	<u>39.2</u>	<u>20.90</u>	<u>18.3</u>	<u>2.98</u>
<input type="checkbox"/> Meas.	<input checked="" type="checkbox"/> Hist.	Initial		

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailer ☐ Other:

Purge Rate: ~200 ml/min

Begin Purge: Time: 1325 Total Volume Purged: ~3 gal

End Purge: Time: 1425 Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1430

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailer ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear; no odor; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium, pH 2.1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	

Notes: - pump from 27' bgs

Sampler Signature: [Signature]

Date: 10/18/12Well ID: RA-MW-12C**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
<u>1325</u>	<u>20.90</u>	<u>0</u>	<u>13.61</u>	<u>722</u>	<u>1.28</u>	<u>7.66</u>	<u>-177.2</u>	<u>0.82</u>
<u>1330</u>	<u>20.90</u>		<u>13.30</u>	<u>714</u>	<u>0.97</u>	<u>7.67</u>	<u>-202.5</u>	<u>0.66</u>
<u>1335</u>	<u>20.90</u>		<u>13.28</u>	<u>680</u>	<u>0.43</u>	<u>7.72</u>	<u>-211.9</u>	<u>0.31</u>
<u>1340</u>	<u>20.90</u>		<u>13.29</u>	<u>476</u>	<u>0.57</u>	<u>7.72</u>	<u>-213.3</u>	<u>0.32</u>
<u>1345</u>	<u>20.90</u>		<u>13.27</u>	<u>470</u>	<u>0.52</u>	<u>7.73</u>	<u>-214.8</u>	<u>0.20</u>
<u>1350</u>	<u>20.90</u>		<u>13.29</u>	<u>663</u>	<u>0.46</u>	<u>7.74</u>	<u>-218.6</u>	<u>0.28</u>
<u>1355</u>	<u>20.90</u>		<u>13.31</u>	<u>644</u>	<u>0.38</u>	<u>7.76</u>	<u>-220.3</u>	<u>0.36</u>
<u>1400</u>	<u>20.90</u>		<u>13.26</u>	<u>623</u>	<u>0.29</u>	<u>7.78</u>	<u>-217.3</u>	<u>0.42</u>
<u>1405</u>	<u>20.90</u>		<u>13.20</u>	<u>606</u>	<u>0.28</u>	<u>7.77</u>	<u>-209.6</u>	<u>0.33</u>
<u>1410</u>	<u>20.90</u>		<u>13.18</u>	<u>596</u>	<u>0.39</u>	<u>7.76</u>	<u>-197.0</u>	<u>0.29</u>
<u>1415</u>	<u>20.90</u>		<u>13.23</u>	<u>580</u>	<u>0.42</u>	<u>7.77</u>	<u>-189.6</u>	<u>0.57</u>
<u>1420</u>	<u>20.90</u>		<u>13.21</u>	<u>568</u>	<u>0.47</u>	<u>7.77</u>	<u>-181.6</u>	<u>0.42</u>
<u>1425</u>	<u>20.90</u>		<u>13.23</u>	<u>557</u>	<u>0.49</u>	<u>7.78</u>	<u>-178.2</u>	<u>0.30</u>

Notes :



# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: RA-MW-12B  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 120057-24  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/18/12 1430 Weather: overcast, ~65°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1432</u>	<u>33.0</u> <input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<u>21.00</u> Initial	<u>12.00</u>	<u>1.96</u>

Water Level Measurement Method: ☒ Electric Tape ☐ Other: \_\_\_\_\_

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailor ☐ Other: \_\_\_\_\_

Purge Rate: ~200 mL/min

Begin Purge: Time: 1435 Total Volume Purged: ~3 gal

End Purge: Time: 1535 Well Volumes Purged: \_\_\_\_\_

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other: \_\_\_\_\_  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other: \_\_\_\_\_

Sample Time: ~200 mL/min <sup>390</sup> 1540

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailor ☐ Other: \_\_\_\_\_

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other: \_\_\_\_\_

Sample Description (color, turbidity, odor, sheen, etc.): clear; sulfur smell; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH 2.1</u>
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____
_____	_____	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	_____

Notes: -pump from 27' bgs

Sampler Signature: [Signature]

Date: 10/18/12Well ID: RA-MW-12B**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
<u>1435</u>	<u>21.00</u>	<u>Ø</u>	<u>13.46</u>	<u>819</u>	<u>2.70</u>	<u>7.14</u>	<u>-120.7</u>	<u>3.20</u>
<u>1440</u>	<u>21.02</u>		<u>13.36</u>	<u>897</u>	<u>0.82</u>	<u>7.23</u>	<u>-173.1</u>	<u>0.77</u>
<u>1445</u>	<u>21.02</u>		<u>13.32</u>	<u>892</u>	<u>0.55</u>	<u>7.28</u>	<u>-180.9</u>	<u>0.58</u>
<u>1450</u>	<u>21.02</u>		<u>13.28</u>	<u>888</u>	<u>0.38</u>	<u>7.31</u>	<u>-189.9</u>	<u>0.76</u>
<u>1455</u>	<u>21.02</u>		<u>13.34</u>	<u>888</u>	<u>0.33</u>	<u>7.33</u>	<u>-194.0</u>	<u>0.67</u>
<u>1500</u>	<u>21.02</u>		<u>13.37</u>	<u>887</u>	<u>0.30</u>	<u>7.34</u>	<u>-197.5</u>	<u>0.50</u>
<u>1505</u>	<u>21.02</u>		<u>13.36</u>	<u>875</u>	<u>0.23</u>	<u>7.36</u>	<u>-203.5</u>	<u>0.28</u>
<u>1510</u>	<u>21.02</u>		<u>13.38</u>	<u>873</u>	<u>0.21</u>	<u>7.37</u>	<u>-204.1</u>	<u>0.31</u>
<u>1515</u>	<u>21.02</u>		<u>13.38</u>	<u>870</u>	<u>0.21</u>	<u>7.37</u>	<u>-205.8</u>	<u>0.45</u>
<u>1520</u>	<u>21.02</u>		<u>13.44</u>	<u>868</u>	<u>0.19</u>	<u>7.38</u>	<u>-209.4</u>	<u>0.35</u>
<u>1525</u>	<u>21.02</u>		<u>13.44</u>	<u>862</u>	<u>0.17</u>	<u>7.38</u>	<u>-210.2</u>	<u>0.48</u>
<u>1530</u>	<u>21.02</u>		<u>13.43</u>	<u>859</u>	<u>0.16</u>	<u>7.39</u>	<u>-211.8</u>	<u>0.60</u>
<u>1535</u>	<u>21.02</u>		<u>13.45</u>	<u>855</u>	<u>0.20</u>	<u>7.40</u>	<u>-214.3</u>	<u>0.79</u>

**Notes :**

- mod to strong sulfur smell throughout purging.





# Groundwater Sampling Record

Project Name: Frontier Hard Chrome - Event 18 Well ID: RA-MW-12A  
Project Location: 113 Y St., Vancouver, WA 98661 Sample No.: 1210057-25 (1210057-26-QA-4)  
Project Number: 10799.004.004.0002 Sampler(s): Brian P. Reilly - WESTON  
Date/Time: 10/18/12 1545 Weather: overcast, ~65°F

## Water Level Measurements and Purge Data

Time	Depth of Well (TOC)	Depth to Water (TOC)	Feet of Water in Well	Gallons per Well Volume (2" dia. = 0.163 gal/ft, 4" dia. = 0.653 gal/ft)
<u>1545</u>	<u>28.1</u>	<u>14.41</u>	<u>13.69</u>	<u>2.23</u>
	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	<input type="checkbox"/> Meas. <input checked="" type="checkbox"/> Hist.	

Water Level Measurement Method: ☒ Electric Tape ☐ Other:

Well Evacuation Method: ☒ Peristaltic Pump ☐ Submersible Pump ☐ Bailor ☐ Other:

Purge Rate: ~200 mL/min

Begin Purge: Time: 1545 Total Volume Purged: ~4.5 gal.

End Purge: Time: 1755 Well Volumes Purged:

Purge Water Disposed: ☐ 55-gal Drum ☐ Storage Tank ☐ Ground ☐ Liquibin ☒ Other:  
5-gallon Plastic Buckets to be disposed at City of Vancouver's City Operation Center

## Sample Collection Method & Analysis

Sample Type: ☒ Groundwater ☐ Surface Water ☐ Other:

Sample Time: 1800

Sample Collection Method: ☒ Pump Type: Peristaltic Dedicated ☒ Y ☐ N ☐ Bailor ☐ Other:

Decon Procedure: ☒ N/A ☐ Alconox Wash ☐ Tap Rinse ☐ DI Water ☐ Other:

Sample Description (color, turbidity, odor, sheen, etc.): clear; strong sulfur smell; no sheen

## Sample Containers

Quantity	Size	Bottle Type	Laboratory Analysis
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	<u>T. Chromium; pH 2.1</u>
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input type="checkbox"/> Poly	<u>D. Chromium; pH 2.1</u>
<u>QA-4</u>		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	
<u>1</u>	<u>500 mL</u>	<input type="checkbox"/> Glass <input checked="" type="checkbox"/> Poly	<u>T. Chromium; pH 2.1</u>
		<input type="checkbox"/> Glass <input type="checkbox"/> Poly	<u>Sample Time = 1805</u>

Notes: - pump from 26' bgs

Sampler Signature: [Signature]



Date: 10/18/12Well ID: RA-MW-12A**Well Evacuation / Field Parameters**

Time	Depth to Water (TOC)	Volume (gallons)	Temp (°C)	Cond (µS/cm)	DO (mg/L)	pH	ORP (mV)	Color/Turbidity
1550	14.41	φ	14.01	2046	4.88	7.45	-254.9	101
1555	16.83		13.85	2154	4.00	7.43	-261.5	68.1
1600	19.24		13.90	2140	4.79	7.41	-256.3	83.0
1605	21.25		13.94	2127	4.34	7.42	-256.4	119
1610	23.10		13.98	2124	4.39	7.43	-260.2	188
1615	24.45		13.98	2140	3.38	7.43	-266.8	158
① 1620	25.38		13.88	2181	3.41	7.44	-270.5	110
② 1625	26.48		13.67	2241	3.09	7.43	-299.1	69.6
③ 1630	27.56		13.58	2276	3.37	7.43	-274.8	68.8
1710	21.48		14.61	2300	2.95	7.55	-295.0	86.2
1715	22.90		13.59	2293	2.47	7.48	-287.7	63.7
1720	24.50		13.60	2270	1.47	7.44	-292.0	45.5
1725	25.15		13.63	2251	0.91	7.38	-295.3	8.39
1730	26.50		13.60	2258	2.26	7.39	-285.8	10.4
1735	26.78		13.58	2266	2.30	7.42	-280.5	17.1
④ 1740	27.55		13.55	2274	3.79	7.43	-275.4	10.1
1755	24.40		14.06	2271	2.88	7.50	-278	12.1

**Notes:**

- ① dropped depth to 27' bgs.  
 ② dropped to 27.5' bgs  
 ③ 1632 H<sub>2</sub>O level drops below wire, allowed well to recharge  
 ④ 1742 H<sub>2</sub>O level again below, allow well to recharge.  
 -very strong sulfur smell throughout.  
 -recharging @ rate of ~1' per 5 minutes / or .0326 gal/min or 123 ml/min

## GROUNDWATER LEVEL DATA

Page 1 of 1

Project Name: Frontier Hard Chrome - Event 18

Log Date: 10/15/12

Project Location: 113 Y St., Vancouver, WA 98661

Measurement Method: Water Level Electric Sounder

Project No.: 10799.004.004.0002

Logged By: Brian P. Reilly - WESTON

[illegible]

\*Measurement Reference Point from ☐ Top of Ground or ☒ Top of Casing

#1 - appears original wellhead was misinterpreted w/ new post. See photos  
#2 - couldn't find WBS-3A

RECEIVED

JAN 14 2013



**Weston Solutions, Inc.**

23226 NE 29<sup>th</sup> Court

Sammamish, Washington 98074

OFFICE OF  
ENVIRONMENTAL CLEANUP

January 9, 2013

Guy Barrett  
Washington State Department of Ecology  
Toxics Cleanup Program  
P.O. Box 47600  
Olympia, WA 98504-7600

**SUBJECT: EVENT 18 LONG TERM MONITORING REPORT  
FRONTIER HARD CHROME SITE,  
VANCOUVER, WASHINGTON**

Dear Mr. Barrett,

Weston Solutions, Inc. (WESTON®) is pleased to submit one hardcopy of the Frontier Hard Chrome Event 18 Long-Term Monitoring Report. An electronic copy of this report was submitted to you via email on December 27, 2012. This report discusses the groundwater monitoring results that were obtained from site sampling on October 15 through October 18, 2012. During this sampling event, well B87-8 was sampled for hexavalent chromium.

Please feel free to contact me if you have any questions.

Sincerely,  
**Weston Solutions, Inc.**

A handwritten signature in black ink, appearing to read "Greg Stuesse", with a long horizontal flourish extending to the right.

Greg Stuesse, PE, LG  
Senior Project Manager  
(206) 715-6752

[G.Stuesse@westonsolutions.com](mailto:G.Stuesse@westonsolutions.com)

Cc:

Claire Hong (U.S. EPA)  
Brian Reilly (WESTON)  
Project File